A study on factors associated to low birth weight in the new born babies of Bheri Zonal Hospital and teaching hospitals of Nepalgunj Medical College in Banke

Submitted to

Department of Community Medicine and Family Health
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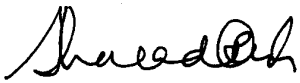For the partial fulfillment of the degree of Masters in Public Health (MPH)

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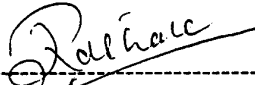**Dhir Jung Shah**

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Approval Sheet

This is to certify that Mr. Dhir Jung Shah has prepared this thesis entitled "A study on *factors associated to low birth weigh in the new born babies of Bheri Zonal Hospital and teaching hospitals of Nepalgunj Medical College in Banke"* under our guidance and supervision.

This thesis is prepared as partial fulfillment of the requirement for the degree of Master in Public Health (MPH) from Tribhuvan University. This thesis has been accepted and recommended for the final approval.

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Summary

Low birth weight, birth weight less than 2,500 gram, is a significant clinical and public health challenge. It is the single most important determinant of health in the children and reflects mother's health and nutrition and cares she receives during pregnancy. In Nepal low birth weight stems primarily from the mother's poor health and nutrition. The prevalence of low birth weight of Nepal is estimated to be 25- 27 percent.

The World Health Summit for Children (1990) which had set its goal to reduce LBW from the base-line level to less than 10% by the year 2000. The National Planning Commission, on its nutritional planning sets the goal for reduction of low birth weight prevalence to one third of the base line level.

Thinness among young women is about 25% (less than BMI 18.5), which means women of reproductive age are chronically deficient in energy for their needs and are likely to give birth to under weight baby. Two thirds of IMR in Nepal occur within first month of life that is primarily due to low weight at birth. The factors aggravating to low birth weight need to be investigated, even at different localities of country to support in program planning and intervention for reducing LBW.

Prevalence of malnutrition in Nepal, both of mothers' and of children is inherited by birth. This intergenerational cycle has been happening since many years. The mother who gives birth to low birth weight baby is already suffered from lack of energy, anemia, stunting and some infections contributing in "small mother- small baby" cycle.

The overall prevalence of low birth weight in Nepal is still at the alarming condition, which should be the matter of great concern for all those who are being involved in public health field. This study was carried out in Banke district at Bheri Zonal Hospital, at Nepalgunj and Teaching Hospitals of Nepalgunj Medical College, Nepalgunj and at Kohalpur.

The general objectives of study were to find out the proportion of low birth weight and the factors associated to low birth weight in the selected hospitals. The study design was descriptive cross

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sectional in nature. The study enrolled 225 mothers admitted for delivery in these three hospitals. Data were collected prospectively for the period 42 days, beginning from the 25, Poush 2059 to 8, Falgun 2059. Thus the sampling method was adopted purposely for the convenience. So this is like a census for certain period. The tools for data collection were semi-structured questionnaire, equipment for measuring height and weight for mothers and children. Interview with mothers, recording of information by observation and an interview with the medical recorders and other related personnel were made while collecting the information.

The study has found that 22.7 % of baby born at these hospitals were with low birth weight than the recommended by World Health Organization. The proportion of LBW this study was slightly lower than the finding of a multi hospital based study" (26%) in 1999. The average birth weight of the babies was 2800 gram. The factors strongly associated with low birth weight were low maternal weight, short stature of mother, low educational level of mother and father, long hours of physical activities during pregnancy, inadequate food intake during pregnancy, low family income of and inadequate antenatal visit. Percentage of hospital delivery in Banke district was higher than the national level (9%) and increased from 11.0% to 14.3% between 2054/55 and 2058/59.

In this study, low birth weight over the last five years is not following specific trend. Based on the hospital record proportion of low birth weight was 22.4% in 2054/55 and 28.0% in 2058/59. Similarly the proportions of low birth weight were 12.4 %, 32.4% and 26.3% in the year 055/56, 056/57 and 057/58 respectively.

The study revels that 42.2% of mothers with low birth weight babies perceived that their babies was small. Similarly positive predictive value for predicting normal weight at birth was 80.8% among mothers with normal weight babies. With the reference of this result method can be applied in the community to estimate prevalence of low birth weight where weighing of newborn cannot be feasible.

It is concluded that the prevalence of low birth weight has not been reduced to the level targeted by the National Nutrition Program. Thus, program activities relating to the children and mothers specially in reducing these affecting factors on low birth weight need to be more effective.

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Abbreviations

ANC	=	Antenatal care
CBS	=	Central Bureau of Statistics
CI	=	Confidence interval
FWRD	=	Far Western Development Region
IMR	=	Infant Mortality Rate
IOM	=	Institute of Medicine
JNMA	=	Journal of Nepal Medical Association
LBW	=	Low Birth Weight
LMP	=	Last Menstrual Period
MHBS	=	Multi Hospital Based Study
MI	=	Micronutrient Initiative
MIRA	=	Mother and Infant Research Activities
MUAC	=	Mid Upper Arm Circumference
MWRD	=	Mid Western Development Region
NBW	=	Normal Birth Weight
NDHS	=	Nepal Demographic and Health Survey
NMIS	=	Nepal Multiple Indicator Surveillance
NMR	=	Neonatal Mortality Rate
NMSS	=	Nepal Micronutrient Status Survey
OR	=	Odds Ratio
RH	=	Reproductive Health
SCF	=	Save the Children Fund
SEARO	=	South East Asia Regional Office
SFD	=	Small for Date
SGA	=	Small for Gestational Age
SMP	=	Safe Motherhood Program
SWCH	=	Status of Women, Children and Household
UNICEF	=	United Nations Children's Fund
VDC	=	Village Development Com

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Chapter I

Introduction

1.1 Background

Geographically Nepal is divided in three regions; Mountain, Hill and Tarai residing 7.3, 44.3, and 48.4 percent of the population respectively. Based on area, districts these regions constitute 35, 42 and 23 percent of the total land area. There are five developmental region 75 districts in the administrative purpose. Districts are further divided into several smaller units called VDC and Municipality. Currently, there are 3,915 VDCs and 58 Municipalities in the country. Each VDC consists of 9 wards, and Municipality ward ranges from 9 to 35.[1]

Despite steady improvement, Nepal's children face major obstacle to a healthy life. The Infant Mortality Rate (IMR) is 64.1 per thousand live births, Neonatal Mortality Rate (NMR) is 38 per thousand live births and under 5 year mortality rate (CMR) is 91 per thousand life birth. Only 14% of population reside in urban areas. Women marry at a mean age of about 18 years and 50% have begun child bearing by 19 years. Among the age 15-19 years, 16% already became, mothers 5.2% are pregnant with first child and 21.4% have begun child bearing.[2]

Nepal Demographic Health Survey 2001 states that chronic energy deficiency in Nepal is relatively high among the women. About 27% of women fall below the 18.5 cut off line for the Body Mass Index (BMI). One in seven women is shorter than 145 cm and can be considered at nutritional risk. Three in four women who gave birth (in proceeding five years than survey) have been found not having iron and folic acid during pregnancy.

Birth weight is an important determinant of infant's survival and future development. It also reflects mother's health, nutrition and cares she receives during pregnancy. Low birth weight predisposes a baby to early death, illness in infancy and childhood and impediments to normal development. Estimated prevalence rates of low birth weight have been given from 14% in community-based studies to 32% in hospital base onces.[3]

Introduction of Banke district

Geographically the district falls in the Tarai plain of Mid Western Development Region. Dang, Bardia, Shurkhet and Salyan surround the district on the east, west, north and southern east respectively. The district is faced with India on the south. Nepalgunj, the headquarter of the district is the main urban center for the people of 25 districts of Mid and Western Region of the country. Some of the particulars of the district are:[4]

Some indicators of the district:

Area total = 2.337 Square kilo meter, Percentage of total national area = 1.58

Constituency = 3, Municipality = 1, Total VDC = 46,

Total population = 391081 (Male=201416, Female = 190387)

Total houses = 71125, Expected pregnancy (59/60) = 17910)

Health service facilities

There are three hospitals, one DPHO, two PHC, two Ayurvedic Aushadhalaya, ten Health Posts and 35 Sub Health Posts covering services for entire district. Apart from these public health facilities there are other two one Army and one Police hospitals in the district.

Bheri Zonal Hospital

The hospital is located at ward No.13 of Nepalgung Municipality. The hospital was established in 1890 AD named with Prithivi Bir Hospital, Dispensary. The hospital was renamed again as Ratna Rajya Laxmis Devi Prasuti Griha and Sewa Sadan in 2016 BS. This name was changed into Bheri Zonal Hospital in 2022 BS with 50 beds. The hospital was upgraded to100 bedded in 2043 and Hospital Development Board was formed at that time. At present, hospital serves as referral center for Mid and Far Western Development Region with the capacity of 150 beds.

Teaching Hospital of Nepalgunj Medical College

For public services, there are two hospitals of Nepalgunj Medical College. The teaching hospital, one branch is situated in Nepalgunj near to Bheri Zonal hospital and the next one is situated in

Kohalpur, 17 km away from Nepalgunj. The hospitals of Nepalgunj Medical College have been providing services since 2054. Currently there are 450 beds at the teaching hospital.

1.2 Statement of the problem

Global scenario of low birth weight

In the developing countries low birth weight stems primarily from the mother's poor health and nutrition. Three factors have most impact: the mother's poor nutritional status before conception, short stature (due mostly to under nutrition and infections during her childhood), and poor nutrition during the pregnancy. Inadequate weight gain during pregnancy is particularly important since it accounts for a large proportion of fetal growth retardation.[5]

Two third of birth weights in the world are not recorded. According to most recent estimate for 145 countries, approximately 14% or 18 million new born each year are low birth weight. More than half of a low birth weight infant in the world is born in South Asia. By contrast, the percentage of low birth weight babies in the industrialized country is only 7 percent. [6]

Figure1. Global scenario of LBW
(Cases in Million)

Legend:
- South Asia
- East Asia
- North Africa
- CEE/CLS
- Sub Saharan Africa
- Latin America
- Industrialize
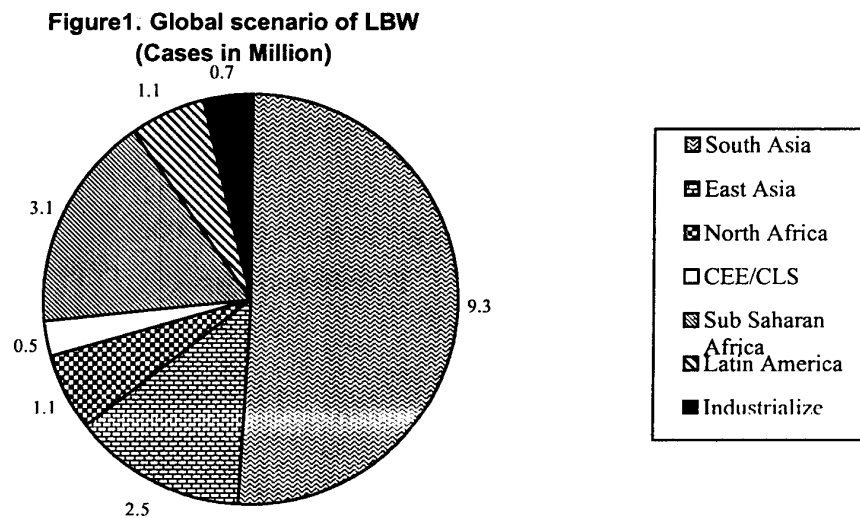
Every year between 15 and 30 million infants up to 20% of all infants are born with a low birth weight. Low Birth infants are at risk of dying in the neonatal (40 fold greater chance), mental retardation and learning disabilities (50% grater chance), IQ decrease of 5-10 points, visual and hearing disabilities illness associated with cardiovascular and diabetes in later life.[7]

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One of the goals of World Summit for Children is the reduction of LBW to less than 10% by the year 2000. [5] The targets of Ninth Five Year Plan and Second Long Term Health Plan of Ministry of Health are the reduction LBW to 23% and below 12% respectively.[8]

Low Birth Rate is closely associated with neonatal and post neonatal mortality and in general mortality. WHO has estimated that 16% of all infants born in the world are low weight at birth. Ninety percent of them fall in developing country. The situation of low birth of in the South Asia lies between 20 to 30 percent.[9]

Low birth weight which is defined by WHO as a birth weight less than 2500 gram is the result of either in short period of gestation retarded intrauterine growth. The lowest mean birth weights in world have been reported from Asia. In Indian subcontinent, the mean birth weight between 2700 to 3000 gram with corresponding to 30-40% LBW. In developed countries the mean birth ranges from 3300-3500 gram corresponding to LBW of 4-8 percent.[7]

Low Birth Weight in South Asia

Around 12 million infants are born with low birth weight each year in the countries of South Asia Region, which is more than half of the world. This figure corresponds with the prevalence rate of 28 percent in the region. Similarly prevalence of LBW is estimated at between 30-50 percent in Nepal probably highest in this region after Bangladesh[7] (Table 1).

Table 1. The prevalence of low birth weight in South Asia (2002) [7]

Countries	Percent prevalence	Number of infant/year
Afghanistan	20	228,000
Bangladesh	50	1,752,000
Bhutan	15	11,400
India	21.8	8,081,000
Maldives	18	2000
Nepal	30-50	235,800-393,000
Pakistan	25	1,337,000
Sri Lanka	18	59000
Total	28	11,800,000

Low Birth Weight in Nepal

Birth weight is an important determinant of the infant survival and future development. It is the indicator, which reflects mother's heath and nutrition status, and the care she receives during pregnancy. LBW is one of the predisposing factors for neonatal death, illness in childhood and impediments to normal development.[3]

Reduction of mortality and morbidity among pregnant women and newborn during childbirth and there after is the expected outcome of SMH program. Malnutrition causes enormous burden on child and women's health in Nepal the latest survey (NMNSS) reveals that 54% under years are stunted (low height for age), 47% are under weight (low weight for age) and 7% of the children below 5 year are wasted (low weight for height). One important cause in Nepal is that 30-40 percent of children is born in low birth weight.[8]

High prevalence of LBW means children are already seriously affected by malnutrition when they born. Low birth weight also contributes in an intergeneration cycle of malnutrition in Nepal. Small babies becomes small mother giving small babies If the nutrition status of pregnant women is adequate or if she gains 20 percent weight during pregnancy, the chances for being low birth weight will be only 2%.[8]

The National Plan of Action on Nutrition, endorsed by the National Planing Commission has set to additional goals for the year 1998 to 2003 period: reduction in the prevalence of stunting to 50% of the base line level and reduction of prevalence of low birth weight babies by one third of the base line level.[10]

A high fertility rate (4.1 per women) indicates that a large number of children are born in Nepal every year, which is estimated at 858,145. Among them 39 per thousand new born die within first month of life. Approximately two third of all death in the first year of life occur in the first month of life. Out of these deaths approximately two third occurs in the in the first week of the life. Similarly two third of these deaths of the first week, again occur at the first day of life.[11]

Pre-maturity is the one of the factors causing for neonatal mortality. Hospital based data suggests direct medical causes of neonatal death in Nepal report, infection, low birth weight and asphyxial trauma.[11]

The commonest cause of death in children under in- five years of age is diarrhoeal diseases, pneumonia, malnutrition, measles and trauma. In the neonates, the death is related to premature birth, low birth weight, birth asphyxia and birth trauma. [12]

The following are the some of the assessments conducted from the past 13 years in which prevalence of LBW ranges between 14-35% including both hospital and community based estimates [3] (Table 2).

Figure 2 Prevalence of LBW in recent 5 years
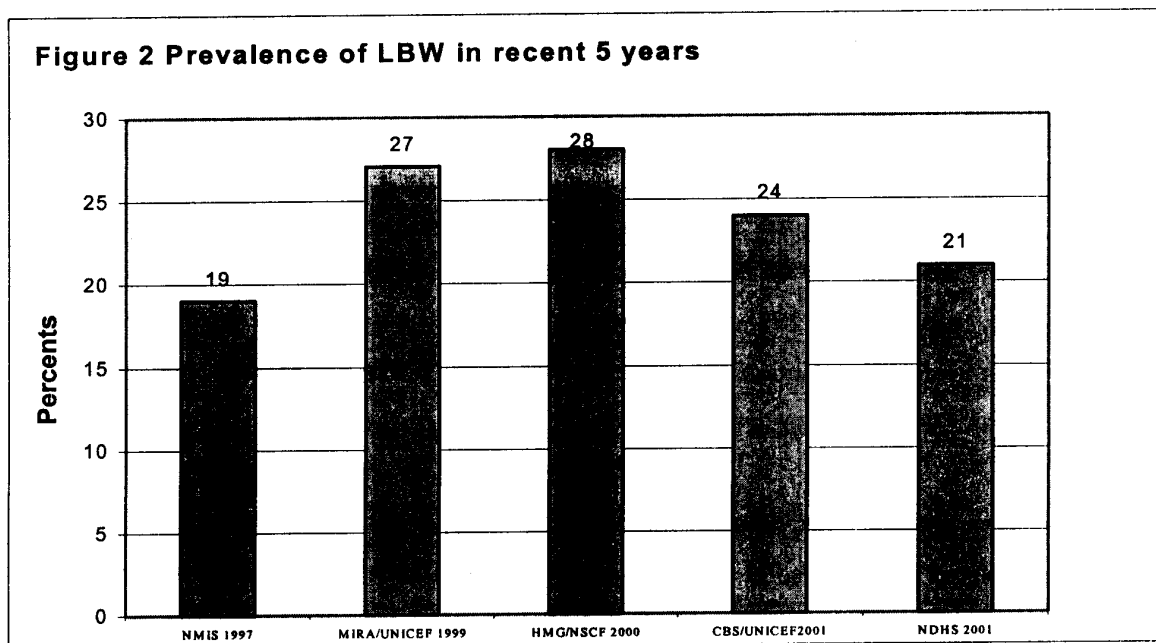
Table 2. Some of the prevalence studies of low birth weight in Nepal

Investigator	Year	Site	Number	Prevalence (%)	Method of estimation
NFHS .	1996	All Nepal	4375	25	Mothers' recall of infant size
NMIS	1998	All Nepal	17243	19	Mothers' recall of infant size
Dali.	1989	TUTH	1000	20	Hospital based study
Manandhar.	1997	Maternity Hospital, Kathmandu	578	32	Hospital based study
WHO/SEARO	1990	Chitwan District	2284	14	Community based study
WHO/SEARO	1990	Maternity Hospital, Kathmandu	3096	22	Hospital based study
MIRA/UNICEF	1999	Multicentre	3636	27	Hospital based in four region
		Maternity Hospital	2283	20	"
		Pokhara Hospital	704	23.3	"
		Biratnagar Hospital	453	34.7	"
		Nepalgunj Hospital	196	26	"
HMG/N-SCF	2000	Maternity hospital	15980	28	Hospital based
		Patan hospital	5790	17.3	Hospital based
	2000	TUTH	2,695	14	Hospital based
CBS,UNICEF		Country level		24	Mother's recall
NDHS	2001	National level		21	Mother's recall

1.3 Justification of the study

The targets of the Ninth Five Year Health Plan and Second Long Term Health Plan of Ministry of Health are to reduce the proportion of low birth weight to 23% and below 12% respectively.[8]

According to the results of the study on delivery, 88% of the deliveries take place in the house. The proportion of mothers reporting delivery of their last child at health institution was 11% at national level, which is slide improvement over 7.6% in the 1996 Nepal Family Health Survey.[13]

ANC service coverage

ANC service is one of the most important indicators of Safe Motherhood Prrogram that is also reflected by outcome of the pregnancy. If quality service is provided to the mother there should be positive trend in the birth weight of newborn infant. Safe Motherhood program recommends that all-expectant mother be examined at least four times during a pregnancy, which can contribute in reduction of LBW if provided effectively. Among these pregnant women 39% had gone for an ANC check up. Nearly 66% of them, who take iron during pregnancy (48.8%), took these tablets for only one-month or less.[13]

Food intake practice during pregnancy is not observed good as much as expected. About 51 % of women reported decreasing food intake during pregnancy, 36% of pregnant women reported the same and only 13% reported an increase food intake. Nearly one fifth of women suffer from health problems in their pregnancy. About 21%of pregnant women smoke and 16% found to be taking alcohol during pregnancy. These all food intake patterns and behaviors indirectly influence on the birth weight of an infant. The national Safe Motherhood program recommends women to deliver babies at facilities under the care of skilled attendants when it is feasible. Traditionally most of the children in Nepal are born at home (89%). At country level, only 9 percent birth are delivered in the health facilities.[13]

As over a quarter of all infants are born low birth weight, and as two third of neonatal deaths occur in this group. Appropriate care for LBW infants is very important if Nepal's present high neonatal and infant mortality rates are to be lowered.

Around 90% of the pregnant women deliver their baby at home at present in the country. The cares and other services for newborn and their mother if provided at that communities level it would be more effective in reducing low birth weight babies. So this is most important to help community level care provider including mother and their relatives by providing current information about low birth weight for the care of these babies and strengthening referral services when they are needed. The results of the several studies on low birth weight are not so consistent to each other for information required for necessary action.

The selected hospital for this study belongs in the Mid Western Development Region where such kinds of studies are seldom conducted. Thus to get accurate and timely information for the support of low birth weight reducing program, this study was conducted at that local base. In addition to this importance of the study, maternal health care services provided in the community level can also be assessed in terms of proportion of hospital delivery and low birth weight babies.

1.4 Study question

What is the prevalence of low birth weight?

What are the factors related to low birth weight?

What is the proportion of hospital delivery?

What is the trend of low birth weight prevalence?

What is the trend of hospital delivery in the district?

How does mother perceive size of their baby?

1.5 Objectives

1.5.1 General objective

The ultimate objective of the study is to estimate proportion of low birth weight and to describe factors associated with it.

1.5.2 Specific objectives

The specific objectives of the study are:

- To estimate proportion of low birth weight among newborn babies.
- To assess the factors associated with low birth weight.

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- To estimate proportion of hospital delivery.
- To assess the perception of mother regarding the size of the baby at birth.

1.6 Variables

Independent	Dependent
Socio-demographic factors • Age • Residence • Ethnicity • Education of mother and father • Occupation of mother and father • Income of family • Family structure • Working hours **Health and nutritional factors** • Weight • Height • Food intake • Iron and folic acid intake **Behavioural factor** • Smoking, alcohol drinking • ANC visit **Reproductive factors** • Parity • Birth spacing • Gestational age • Health problems during pregnancy	**Birth weight**

1.7. Operational definition of variables

Low birth weight

The baby who weights less than 2500 gram at birth is termed as low birth weight.

Proportion of low birth weight

Total number of live births weighing less than 2.5 kg divided by total number of live births times hundred.

Pre term baby

The baby bore before the end of 37 weeks of gestation or before 259 days.

Small for date baby

Baby born at term or pre term that weights less than 2500 gram.

Education

Mothers and their husbands who were unable to read and write were taken as "Illiterate", mothers and her husbands not completing SLC were grouped into "under SLC" and those who had passed SLC were grouped into "SLC and above"

ANC visit

Visits by the pregnant mother to the health facilities or advises received by pregnant mother by medical personnel. Proper ANC service intends at least four visits by every pregnant woman during pregnancy.

Working hour

It indicates how long time a women works during her pregnancy.

Smoking

It refers to cigarette smoking habit of a mother during pregnancy.

Birth weight

Weight of the newborn baby at birth.

Problem in pregnancy

It refers to any kind of health problems or discomfort experienced by pregnant mother frequently during pregnancy.

1.8 Conceptual Framework

Figure 3. Conceptual framework of the risk factors associated to with Low Birth Weight
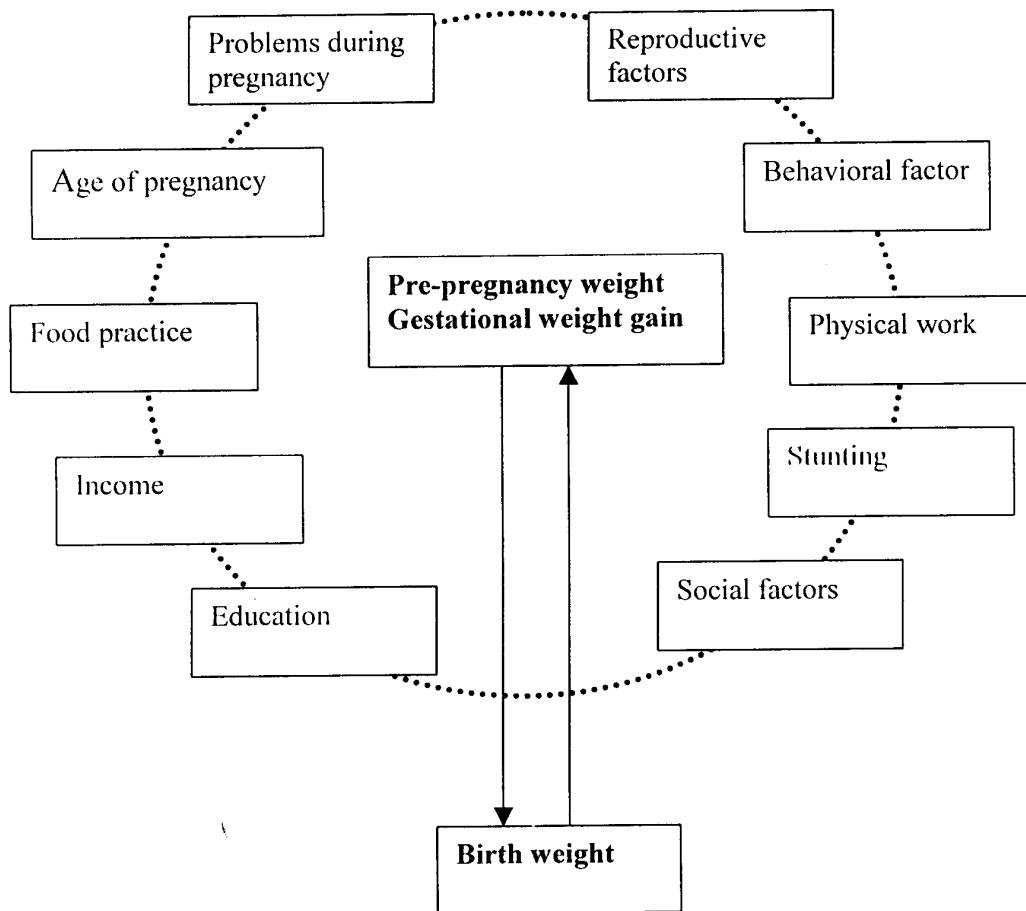
Chapter II

Literature Review

Theoretical concept of low birth weight

The birth weight of an infant is the single most important determining factor for child survival, healthy growth and development. By international agreement, low birth has been defined as a birth weight of less than 2.5 kg.(up to and including 2499 gram). The measurement should be done within hour of life, before potential weight loss has occurred. Birth weight should of at least 2.5 kg for 90 percent of newborn infants and an adequate growth of the children (by weight for age) together constitute global indicator number 8 for monitoring and evaluation of global strategy of Health for All. The terms used to define newborn babies in relation to gestational age of delivery.

A low birth weights infant then, is any a birth weight of less than 2.5 kg regardless of gestational age. Therefore low birth weight is reflected in the two forms viz., Pre term and Small for date. Pre term babies, born too early or before 37 weeks of gestation. In such birth intra-uterine growth may be normal for the duration of gestation. These baby catches up growth with normal, growth and performance after few months if good neonatal care are given. Two thirds of all LBW babies in developed countries are estimated to be pre term. Causes of pre term baby are multiple births, acute infections and hard works etc are preventable by screening.

Small for date (SFD), babies are born at term or Pre term, their weight fall in below the tenth percentile for the gestational age and found to be associated with intrauterine growth retardation. Factors associated with SFD are multiple; mothers-placenta-fetus interrelated. Maternal factors include malnutrition, anemia, heavy physical work, hypertension, malaria, smoking, poverty, short stature, vary young age, high parity, close birth interval, low educational status and family supports.

The birth weigh should be taken preferably with in the first hour of life before postnatal weight loss, the naked baby should be placed on a clean towel on the scale pan. The average birth weight being lower in developing countries is not due to genetic origin but it is due largely to maternal factors [14]

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The definition of low, very low and extremely low birth weights do not mutually exclusive categories. Below the set limits they are all-inclusive and there fore overlap i.e. low includes very low and extremely low while very low includes extremely low.[15]

Very low birth weight is the weight of the newborn baby, which means less than 1500 gram (up to 1499 gram) at birth. Like wise, extremely low birth weight is meant by the new born baby who weighs less than 1000 gram. Gestational age is one of the important determinant factors for causing low birth weight, is measured from the first day of LMP. Gestational age is expressed in completed days or completed weeks (event occurring 280 to 286 completed days after the LMP are considered to have 40 weeks of gestation). [15]

Weight gain in pregnancy

On an average, the adult female in the developing countries weighs 28% less and is shorter by 10% compared to the adult females in the developed countries. This adverse effect continues to the offspring of these women. The average weight of the babies in the developing countries is 12% less among the rich families and 16-18% less among the poor families compared to the average birth weight of the babies in the developed countries. In the well-nourished women in the USA and Europe, average weight of women range between 55-60 kg. The average increase in weight during pregnancy is about 10 to 12 kg and the birth weight of the baby varies from3.3 to 3.5 kg. The rest of the weight gain is accounted for by the increase in fat deposit 3.5kg, placenta and amniotic fluid 1.5 kg, uterus and mammary glands 1.4 kg and increase in extra cellular fluid volume about 3 kg.[12]

A small analysis of antenatal care in the Lalitpur rural community had found the average weight of the pregnant women ranged from between 37 to 60 kg (average 47 kg). Among these women the average weight gain during pregnancy was only 4.5 kg. Even for the relatively heavy women with a weight of 57 kg. The weight gain was not more than 4 kg.[12] There is no simple and direct relationship between food intake during pregnancy and weight of the baby at birth. The fetus is similar to a parasite in that it feeds. Under nutrition over a short period of time may not harm the fetus. But the undernourished mother who becomes pregnant and does not eat enough food while carrying on with heavy work will definitely have problems with her pregnancy and childbirth.[12]

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Low birth weight as an indicator of reproductive health

Reproductive health is not a new program but rather new approaches which seek to strengthen the existing safe motherhood, family planning, HIV AIDS STD, child survival and nutrition program with a holistic life cycle approach. The RH program with in which various types of indicators has been developed for strengthening program management. The low birth weight has been chosen as an impact indicator. Thus LBW deserves the much importance in the evaluation of RH program. The extent of problem on low birth weight is strongly associated with the quality services of safe motherhood programs. [16]

To screen LBW babies, a simple anthropometric parameters can be used in rural areas where 80-90% of delivery take place. A sample of 316 newborn single tone babies were studied in a government maternity hospital in Dhaka city to examine the birth weight status of newborn and to identify the relationship between birth weight and other anthropometric parameters of newborn. The mean birth weight was 2889 $\pm$ 468 grams, and 25.18% were low birth weight babies. All key anthropometric parameters of the newborn significantly correlated with one another (p<0.001). The best cut off for detecting low birth weight and normal weight babies were <10cm -Odds ratio = 17.4), <30 cm (odds ratio = 25.0) and < 33 (odds ration = 19.4) respectively for MUAC, chest circumference and head circumference. The sensitivity and specificity were best for chest circumference (83.3% and 83.6% respectively). At lower cut of points of <9, <29.5 cm and <32 cm respectively for MUAC, chest circumference and head circumference, high risk babies could be identify with a minimum number of false positive cases. Chest circumference was the best detector of birth weight, followed MUAC. Beat on finding of the study, it is recommended to use <29.5 and 29.5 to <30.5 cm for chest circumference to identify high risk and at high risk new born respectively.[17]

Reduction of low birth weight on the global agenda

The World Summit for Children- New York, September 1990; 71 Heads of the State and Government and 88 other senior officials pledged to reduce the rate of LBW to less than 10 percent of 1990 levels by 2000.[9]WHO-Safe Motherhood Initiative established in 1987 to draw attention to

dimension and consequences of poor maternal health in developing countries and to mobilize action to address high rates of death and disabilities caused by complication of pregnancy at childbirth. Administrative Committee on Coordination Sub committee on nutrition- Geneva, April 1999 and Washington DC, April 2000;Working group on prevention of Fetal and Infant Malnutrition, It's consequences and Life-Cycle Causes was established in April 1999, Agreed on plan to identify best practices, improve the design of low birth weight reduction programs, and develop interagency proposals to support programs addressing LBW.[9]

Low birth is the term used to define to infants who are born too small, pre term is the term used to defined infants who are born soon. In 1991, 7% of all infants in the United State were born too small and 11% were born too born soon.18. Every year in the United State over 300,000 babies are born with low birth weight. Low birth weight is the single most important determinant of postnatal, neonatal mortality as well as morbidity during infancy and childhood. Sixty five percent of infant death occurs among low birth weight infants.

Research of Boston University School of Medicine and Boston Medical Center have shown that a sub group of pregnant women with certain metabolic gene may be particularly susceptible to adverse effects of cigarette smoking on their infants birth weight.[18]

Maternal height is one of the important factors determining the out come of pregnancy and labor. Reduced maternal height is associated with an increased risk of difficult or obstructed labor and low birth weight. Women who are shorter than 140cm may be at risk. The exact height cut off point below which risk increases may vary country to country. [19]

Height can be used as an indicator of socio-economic status. The height can be increased to some extent through the socio economic improvement thus reducing the rate of low birth and prematurity. Height analysis was categorized into six classes i.e. < 140cm, 140 – 144cm, and 145-154 Cm, 155-160cm and above than 160cm. Proportion low birth weight was found by 45.45% in less than 140cm, and 28.08% in 140-144cm, 21.69% in 145-149cm, 19.62% in the 150-155 cm height group and 21% in the height above 155cm respectively. While analyzing the birth weight in relation to maternal height the result is highly significant for less than 145cm.[19]

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Use of a hospital based study exposes to potential bias. About 90% of birth in Nepal takes place at home. Women, who favor hospital delivery, will tend to be urban and of higher socio-economic status, which should bias estimate of mean birth weight. While accepting this criticism, it is felt that the levels of available data on birth weight in Nepal are so low that hospital based statistics will represent a reasonable place to estimate. Conversely there an argument that woman who delivers in a hospital will be more likely to have experienced complication of pregnancy and thus their babies may be under weight to.[20]

In 1998 a study on mother and child was conducted in 4 Hospitals of 4 developmental region;. Biratnagar zonal hospital in the eastern, Kathmandu (Maternity hospital), Central, Pokhara Western regional hospital and Midwestern Bheri zonal hospital. The study found that prevalence of LBW ranged from 20.4%, 34.7%, 22.3% and 26.0% for Maternity Hospital Kathmandu, Biratnagar, Pokhara and Bheri Zonal Hospital Nepalgunj respectively. The majority of low birth weight were born at term indicating that intrauterine growth retardation makes a major contribution the ratio of pre term to term LBW ranged from 18:82 at the maternity hospital, to 39:61 at the Koshi zonal hospital, with a weighted mean 31:69 for all 4 sites. A bi-variate analysis to identify the factors associated with low birth weight babies revealed the top five to be: low maternal weight, height and BMI, previous Pre term birth interval less than two years. [11]

To estimate prevalence of LBW, total 455 women: 308 who had delivered in the hospital and 147 who had delivered in the community were available for collection of data on recall of size at birth. The recall of small at birth had a sensitivity of 51% for LBW ((95%confidence interval,(40-60%), a specificity of 96% ((94-98%), a positive predictive value of 83% and negative predictive value of 85%. The prevalence of LWB in hospital cohort was 28% (95% CI 23.3-33.6), in the community cohort it was 21 %(95%CI14.8-28.6) and in the combined cohort it was 26% with (95% confidence interval at 21.8-30.0). [21]

Almost 25 million low birth weight infants are born each year, 95% of them in developing countries (WHO). In developing country, low birth infants are more likely to be born at term but due to intra uterine growth retardation (IUGR), secondary to maternal malnutrition and infection. These babies

are small for gestational age (SGA) and represent a major public health problem. A recent study in Brazil showed that SGA babies scored significantly lower on both Bailey mental and motor sub scales at 6 month and difference increased by 12 months.[22]

A study conducted in four unions of selected Thana of Rajshahi district to assess the effect of nutrition education and use of Iron and folic acid by pregnant women on birth weight of newborn. Two groups were selected as experimental and control. Pregnant women in the experimental group in their last trimester were exposed to nutrition education and supplied with Iron and Folic acid. Percentage of LBW was much low in the experimental group compared to control group.[23]

Maternal lean body mass at booking was estimated according to a formula employing the body mass index and maternal age in a sample of 511 women whom booked in the first trimester of pregnancy. The significance of this parameter in comparison with established predictors of birth-weight such as maternal weight, height, smoking, parity, gestational age and sex of the infant was examined using bi-variate correlation and multiple regression analysis. Maternal lean body mass was found to be the most important determinant of birth-weight for gestation percentile. Cigarette smoking had a negative effect on birth-weight, which was independent of maternal physique. The effect of maternal size on birth-weight is largely mediated through constitutional and genetic factors rather than nutrition.[24]

A case-control study of 712 Brazilian mother-baby pairs was performed to assess maternal nutritional factors, more specifically low or marginal concentrations of vitamin A, folate and iron, as risk factors for intrauterine growth retardation (IUGR). The relationship between maternal nutritional status and IUGR was investigated using stratification and logistic regression. According to the final logistic regression model, the risk factors for IUGR were: maternal body weight, per capita income, cigarette smoking, maternal weight gain, prior history of low birth weight, high maternal ferritin, beer intake and coffee intake. Specific interventions likely to have the major short-term impact in this region are not directly related to nutritional factors, but to efforts to reduce or eliminate toxic exposures. Over the long term, improvement in maternal nutritional status and socioeconomic conditions would be expected to produce important benefits.[25]

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Birth weight predicts heart disease

According to a report in this issue of The Lancet, the risk of dying of a stroke or heart disease is highest for men who weighed the least less than 5.5 pounds at birth. And the study of 13,249 men found that the mortality rates fell by 12% for stroke and 10% for heart disease for every incremental increase in birth weight, with those weighing more than 8.5 pounds at birth at the lowest risk of mortality.[26]

The cause of low birth weight may be related to factors affecting the mother during the pregnancy or even her own childhood. According to the Environmental Epidemiology Unit at the Southampton General Hospital in the United Kingdom "Stroke may originate in poor nutrition during the mother's childhood, which deforms the bony pelvis and subsequently impairs her ability to sustain the growth of the placenta and fetus in late pregnancy." Low weights at birth has been associated with non-insulin dependent diabetes and restriction of fetal growth can cause raised blood pressure, both risk factors for cardiovascular disease.[26]

Epidemiological studies on low birth weight infants

The Department of Paediatric, Nair Hospital Mumbai carried a retrospective study over a period of 6 months out in305 low birth weight (LBW) infants, 1997 with the aim to identify the epidemiological factors affecting the birth weight.

Of the maternal factors that were studied, maternal weight of < 45 Kg and fewer than 4 antenatal visits were found to be highly significant risk factors (i.e. $p < 0.01$) while maternal age > 35 year was found to be a significant risk factor (i.e. $p < 0.05$).

Maternal height < 145 cm, haemoglobin < 11 gms% and maternal age < 20 year though not statistically significant were found to have a positive correlation. Maternal medical illnesses like hypertension, cardiac diseases etc. were not found to be significant.

Birth weight is an important predictor of prenatal and neonatal survival. WHO recommends the global definition of low birth weight babies as those with a birth weight of less than 2500 gram. Several authors recommend the term small-for-gestational age, or small-for-date (SFD) especially with pre-term babies as the morbidity and mortality vary. Developing countries have a higher percentage of SFD babies. Growth retarded babies tend to remain small and score lower on cognitive tests during childhood. India has one of the highest rates of low birth weight-30%, (most of which are SFD babies) and LBW accounts for 70% of all perinatal and 50% of all infant deaths.[27]

A mother can be considered high risk if:
Height < 145 cm, Weight < 45 kg, Age < 20 years or > 35 years Parity > 3 Haemoglobin < 11 gm%, Pregnancy induced hypertension, BP > 140/90, and any systemic illness.

An LBW is five times more likely to die in the peri-natal period and 3 times more likely to die in infancy. Correlated factors affecting LBW were the maternal height, weight, Hb, parity, educational status, number of antenatal visits and the presence of any complications. Of these, the first 3 i.e. height, weight, Hb were found particularly important because they indirectly reflect the socio-economic status and dietary intake of the mother.[27]

Factors affecting long term developmental outcomes

Social and environmental disadvantages clearly affect the long-term developmental outcomes of low birth weight children whether measure in terms of maternal education, race, or social classes. For most low birth weight children, social risk factors have far greater effects on long-term cognitive outcomes than do biological risk factors. There is also evidence that the cognitive deficits specially associated with social or environmental risk become more pronounced over time. Despite speculation that very low birth weight children are susceptible to adverse effects of the environment than normal birth weight children.[28]

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Biological factors

Low birth weight is considered an index of biological risk; however, the path physiological basis of risk is often unclear. Medical and or biological factor that contribute to the risk associated with low birth weight include birth defects, male sex, birth asphyxia and neonatal complication of prematurity, periventicular haemorrhage and chronic lung diseases, meningitis seizures, hypoglycaemia and jaundice of prematurity.[28]

Risks for low birth weight babies

Low birth babies compared to normal babies are found suffered more from infections, hypoglycaemia, respiratory problems, haemorrhagic diseases, and hypothermia and feeding difficulties.[29]

According to the report of Nepal Multiple Indicator Surveillance, Fifth Cycle the following variables are considered for increasing risk of low birth weight. [30]

Table.3 Potential risk factors of low birth weight

Factors	Risk	Extent of risk for LBW
Literacy of mother	Illiteracy	2 times
Literacy of father	Illiteracy	1.4 times
Smoking in pregnancy	Smoking	1.5 times
Age of mother	< 20 or > 35 year	1.2 times
Number of pregnancy	4 or more	Slightly
Residence area	Rural	1.4 times
Taking of Iron and folate	Not taking	1.5 times
Health problem during pregnancy.	With health problems	1.5 times
Family support	No support	> 2 times
ANC care	No care	1.4 times

Source: Nepal Multiple Indicator Surveillance, Fifth Cycle, 1998

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Chapter III

Methodology

3.1 Study design

This was a descriptive cross-sectional study.

3.2 Study area

The study was conducted at the maternity ward of Bheri Zonal Hospital Nepalgunj and Teaching Hospital and Research Centers of Nepalgunj Medical College. Kohalpur and Nepalgunj.

3.3 Target population

All mothers admitted for the delivery in three hospitals and their newborn live baby were the target population of this study.

3.4 Sampling method

All the cases visiting for delivery service in selected hospital during the study period were included in this study. So this was a census for a certain period.

3.5 Sampling unit

Newly delivered mother admitted at the hospital wards that met inclusion criteria.

3.6 Sample size

The size of the sample was determined on the basis of estimated prevalence of low birth weight. The estimated prevalence of 25% was got from NFHS 1996.

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For the calculation of sample size

Estimated prevalence of LBW = 25%

Allowable error = at 20% and at 95% CI

Total number of sample expected for study was 300 cases. But due to time constraint the enrollment of cases was limited to 225.

Sample size $= z^2 pq \mid L^2$

Where,   P = Prevalence of LBW which is 25% in newborn baby.

                 q = 1-p

                 Z = Confidence limit of = 95%

                 L = Allowable error at   =20%

3.7 Duration of study

Data were collected prospectively from 26th Poush 2059 to 8th Falgan 2059.

3.8 Exclusion criteria

The following were the exclusion criteria of the study

- Mothers unwilling to participate
- Mentally retarded mothers
- Mothers having twin births
- Mother having stillbirth.

3.9 Instrument

The following devices were used in data collection.
- A semi structured and questionnaire was used to collect the information. The questionnaire was designed for collecting all the required information.
- Separate instrument for measuring height and weight of mother and infants were used.
- Bathroom scale was used for taking weight of mothers and the suitable weighing machine was used for taking weight of the infants.

3.10 Pretest of Instruments

The questionnaire weighing and measuring instruments were pre tested and corrected frequently before start of work and during the process. The necessary re-adjustment and or correction were made when needed.

3.11 Data collection procedure

- A cordial relationship was established with hospital authorities. Purpose and objectives of the study were clearly explained and written permission was obtained before data collection.
- Three female enumerators with nursing background were recruited for data collection
- Mothers were interviewed nearly within 7 days of childbirth. Almost of the normal deliveries were interviewed within three days of delivery. The mother who delivered by caesarian operation was all interviewed within 7 days.
- All babies were weighted within 24 hour of delivery. Almost of the baby's weight was taken within a hour.
- Data related to expected pregnancy, hospital deliveries, and low birth weight record were obtained from respective hospital records and from the records of DPHO.

3.12 Data compiling, management and safety

All the filled questionnaires were collected and checked thoroughly for accuracy and completeness and were reviewed in the presence of enumerators. Questionnaires were handled with great careful, stored and coded for the further analysis. All the dada were entered into Epi info program and analyzed.

3.13 Statistical Analysis

The data were classified, tabulated and were analyzed in terms in ratio and proportions. Epi-Info 6 Version for Windows was used for dada analysis. The data analysis was primarily focused on the defined variables as specified in the objectives. The variables were stratified for further analysis and by including other factors. Values of X^2 test and Odds ratios were calculated for statistical analysis to the association and to compare between risk factors.

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3.14 Limitation of the study

- The result of the study may not represent the whole district. As it is hospital-based study. The results may not be generalized to the whole community.
- Due to limited time and other constraints this study could not hold appropriate sample size enough to meet according to the standard of sampling.
- The responses of the participants in this study may not valid at 100%. There may be some chances of subjective error due to interpretation of concept between interviewers and interviewee and objective error while reading scales.

3.15 Validity and reliability

Following points were the basis for optimizing validity and reliability of the study.

- The study was preceded under the supervision of the qualified research guide of IOM.
- Selection of this subject was based on professional exposure of the investigator.
- Orientation training to the enumerator and assistant was for to reduce errors and biases as possible.
- Concurrent supervision of the enumerators.
- Questionnaire in Nepli language was used for more clarification.
- Instrument for data collection was pre-tested in Bankatwa PHC, necessary correction was made as well.
- Completed questionnaires were frequently reviewed which supported for collecting valid information
- The weighing scales were calibrated at each time while taking weight of children and women.

3.16 Ethical considerations

- A recommendation letter from the campus was obtained to carry out the study. A permission letter was received from the Medical Superintendent of Bheri Zonal Hospital, and Teaching Hospitals of Nepalgunj Medical College. The verbal/ appointment or consignment was taken from mothers.
- Objectives and purpose of the study were clearly explained.
- Any respondent not willing to participate were not forced to participate.

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Chapter IV

Findings

The study enrolled the total of 225 mothers with their newborn baby from the three hospitals located in Banke district. Two mothers were excluded from the study because of their twin birth. The findings of the study are divided into five major sections which are socio-demographic profile of mother, hospital delivery proportion and its and trend, birth weight status of baby, associated factors related to birth weight and perception of mother on the size of baby.

4.1 Scio-demographic characteristics of the mothers

The total mothers delivered at hospital ward were interviewed during the period of study. The general/Socio demographic and basic characteristics of mother are given as below (Table 4).

4.1.1 Age group

The total population was categorized into five classes according to age structure. Below 20 years of age and above 35 years were the lowest and the highest age groups. The age group 20-24 year comprises 48.8 percent of the total study population. The second largest number is under 20-age group, which comprises 20.9% of total population. The age groups 25-29 years, 30-34 years and 35 or above comprises 17.8%, 9.8% and 2.7% of the total respectively (Table 4).

4.1.1.2 Residence

Out of total population, 90 mothers or 40% of them were from urban areas and 135 or 60% were from rural areas (Table 4).

4.1.1.3 Ethnicity

Among total population, 36% of them were Chhetri, which was the largest group among all ethnic groups. Like wise the Brahmin comprised 24%, Tharu 8.9%, Musalim 6.7% and Newar 4% in the enrolled sample. Mothers were classified into others, which comprise 20% of the total population. They all were out of Brahmin, Chhetri, Newar tharu and Musalman. The group "others" includes Gurung Mangar, Giri, B.K and other who did not given five major casts (Table 4).

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Table 4. General characteristics of mother (n = 225)

Characteristics	Percent	Characteristics	Percent
Age group in years		**Family structure**	
Under 20	20.9	Nuclear	43.1
20-24	48.8	Joint	46.9
25-29	17.8	**Total**	**100.0**
30-34	9.8	**Occupation of mother**	
35 or more	2.7	Service	9.0
Total	**100.0**	Business	5.3
Residence		Housewife	82.2
Urban	40.0	Labor	2.2
Rural	60.0	Others	1.3
Total	**100.0**	**Total**	**100.0**
Ethnicity		**Occupation of father**	
Brahmin	24.0	Service	40.0
Chhetri	36.0	Business	20.9
Newar	4.0	Agriculture	21.3
Tharu	8.9	Labor	6.7
Musalim	6.7	Other	11.1
Others	20.0	**Total**	**100.0**
Total	**100.0**	**Family income Rs. per month.**	
Mother's education		Less than 1000	15.1
Illiterate	34.7	1000-2000	19.1
Under SLC	38.7	2000-4000	27.6
SLC or above	26.6	4000-6000	22.2
Total	**100.0**	More than 6000	16.0
Father's education		**Total**	**100.0**
Illiterate	16.4		
Under SLC	36.0		
SLC or above	37.6		
Total	**100.0**		

4.1.1.4 (a) Education level of mother

The table showed that 34.7 % of mother were illiterate, 38.7% of them were under SLC and 26.6% were SLC or above. (Table 4).

4.1.1.4 (b) Education level of father

The proportion of illiteracy among fathers was found to be 16.4%, likewise 36% of fathers were under SLC and 47.6% were SLC or above. (Table 4).

4.1.1.5 (a) Occupation of mother

Mostly they were housewives, comprising about 82.2%. About 2% women were laborers, and 5.3%were involved in business. Out of total 8.9 percent were service holder and 1.3 percent mother reported that they had other kind of occupation.

4.1.1.5 (b) Occupation of father

The respondent mothers said that their husbands were related with service, business, agriculture, laborer and others. The proportion of occupation of the father of newborn baby was found 40 by, 20.9%, 21.9%, 6.7%, and 11.1% respectively for the given occupation.

4.1.1.6 Family structure

Out of total 225 respondents 56.9% were from joint family and 43.1% were from nuclear families, which were enrolled in the study (Table 4).

4.1.1.7 Family Income

The study shows that about 15% of the mother's family income is less then Rs 1000 per month. 27.6% of mothers told that their family income per month is Rs 2000-4000. Similarly 22.2%of mother replied that their family income is between 2000-4000 per month and with 19.1% of households were found earning 1000-2000/month. Only 16% of them reported for having family income more then 6000 per month. (Table 4).

4.2 Hospital delivery proportion and trend

Proportion of hospital delivery service is the set indicator of safe motherhood program, which is used to measure the effectiveness of mother and child health services. Similarly incidence of LBW is taken as a proxy indicator of nutritional and general health status of the women as well as care and services targeted to them. A five-year trend on hospital delivery percentage and incidence of low birth weight was observed. The table shows an increasing trend in hospital delivery (11%in 054/55 to 14.3% 058/59) during the past five years. Hospital delivery proportion is in increasing order (Table 5).

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Table 5. Pattern of hospital delivery and incidence of low birth weight

Years	Expected Pregnancy	Total Deliveries		Low Birth weight	
2054/055	15131	1736	(11 %)	308	(22.4 %)
2055/056	15649	1894	(12 %)	232	(12.4 %)
2056/057	16186	1963	(12 %)	636	(32.4 %)
2057/058	16741	2280	(13.6 %)	600	(26.3 %)
2058/059	17316	2506	(14.3 %)	697	(28.0 %)

The proportion of hospital delivery was observed as 12 %, 12% and 13.6% in the year 055/56,056/57 and 057/58 respectively.

Figure 4. Trend of hospital delivery and incidence of low birth weight (in percentage)
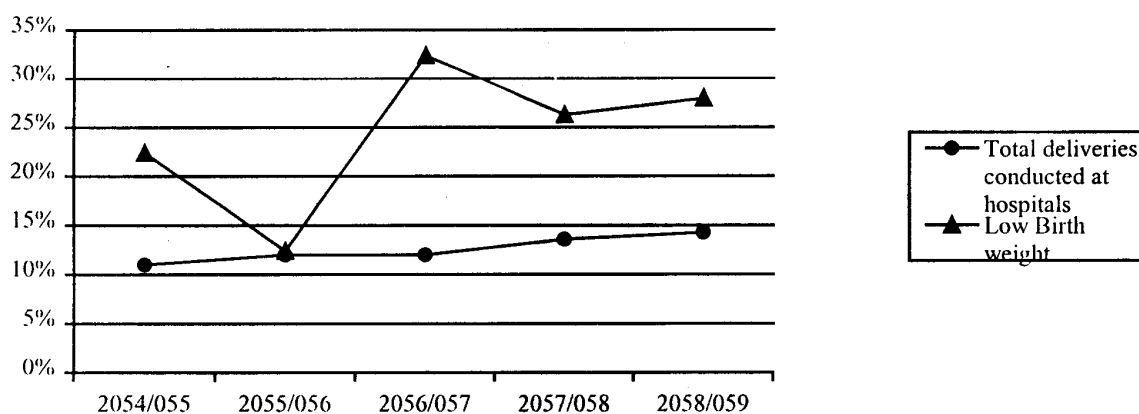
There is no consistent order of proportion of low birth weight during a period five years. The proportion of low birth weight was 22.4% in 045/55, 12.5% in 055/56, 32.4% in 057/58, and 26.3% in 058/059.

4.3 Birth weight of newborn baby

The total of 225 infants born at hospitals was weighted within 24 hours of delivery. In the Teaching hospital of Nepalgunj Medical College, there was a computerized weigh machine giving to the exact weight of the baby. In Bheri Zonal Hospital there was an infant weighing machine with an accuracy of 50-gram to measure the infant's weight.

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Table 6.Birth weight of infants (n = 225)

Birth weight	Percentage	Average weight
Less than 2.5 kg	22.7	
2.5 kg	12.0	2.8 kg
More than 2.5 kg	65.3	
Total	100.0	

The table shows that 22.7% of baby born at are less than 2.5 kg at birth. The cut off point for being low birth weight and the normal birth weight is 2.5 kg. In this study 12% of baby are just at 2.5 kg. The proportion of baby who weighs more then 2.5 kg was found by 65.3%. The mean birth weight of the newborn baby was found to be 2.80 kg,

Table 7.Sex and weight distribution of newborn baby

Sex of baby	Birth Weight		Total
	Low (%)	Normal (%)	
Male	29 (22.3 %)	101 (77.7 %)	130 (100%)
Female	22 (23.2 %)	73 (76.8 %)	95 (100 %)
Total	51 (22.7 %)	174 (77.3 %)	225 (100 %)

Study found out that there is no difference at significant in birth weight among male and female child. Out of 130 male child 22.3 % were found with low birth weight. Among female birth it was found 23.2%.

4.4 Factors associated with the birth weight

The factors in relation to the birth weight of the baby which were studied are given in the following sub headings:

- Scio-economic and demographic factors
- Health and nutritional factors
- Reproductive factors

4.4.1 Scio-economic and demographic factors

4.4.1.1 Age of mother

The proportion of LBW is found highest (36.2%) in the group below 20 years of age. The proportion of LBW among the mothers aged 20-24 years was 20% (n=110). Similarly proportion of LBW was observed by 15%, 18.2% and 33.3% in the age group of 25-29, 30-34 and 35 or above year respectively. These differences are statistically not significant (Figure 5).

Figure 5. Age of mother and birth weight of baby (in percent)
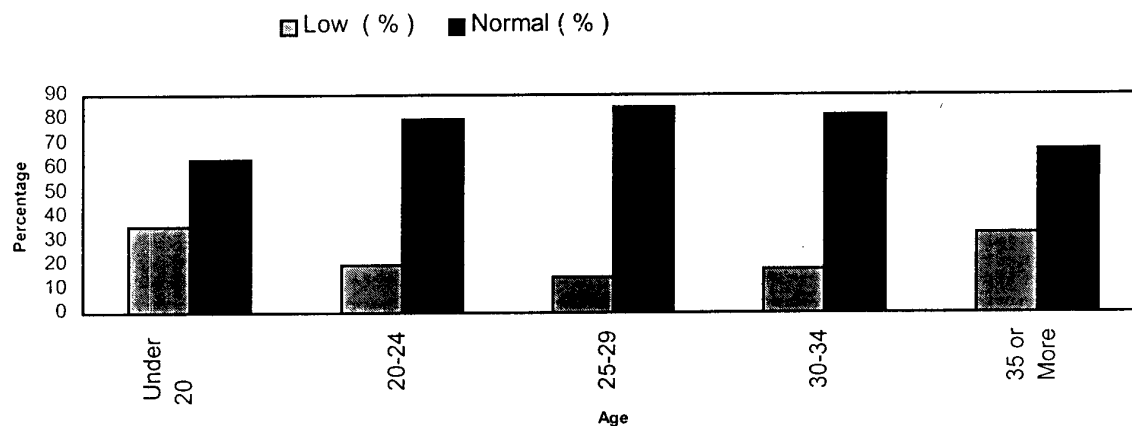
4.4.1.2 Residence of mother

The table shows that residence of mother was not found to be significant in birth weight of baby. But the simple percentage slightly higher numbers of low birth babies were recorded in the urban mothers in relation to rural mothers.

Table 8. Residence of mother and birth weight of baby

Residence of mother	Birth Weight		Total
	Low (%)	Normal (%)	
Rural	30 (22.2%)	105 (77.8 %)	135 (100 %)
Urban	21 (23.3%)	69 (76.7 %)	90 (100 %)
Total	51 (22.7 %)	174 (77.3 %)	225 (100 %)

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4.4.1.3 Education level

(a) Education level of mother

The study found that there was significant difference between the education level of mothers and birth weight status of the baby. More then one third (34.6%) of mother among illiterate group gave birth baby with low weight. Likewise, 19.5% among under SLC and 11.7%in SLC and above group were observed to have low birth weight baby. Low education level of mother seems to be statistically significant (P = 0.0041).

Figure 6. Education of mother and birth weight of baby (%)
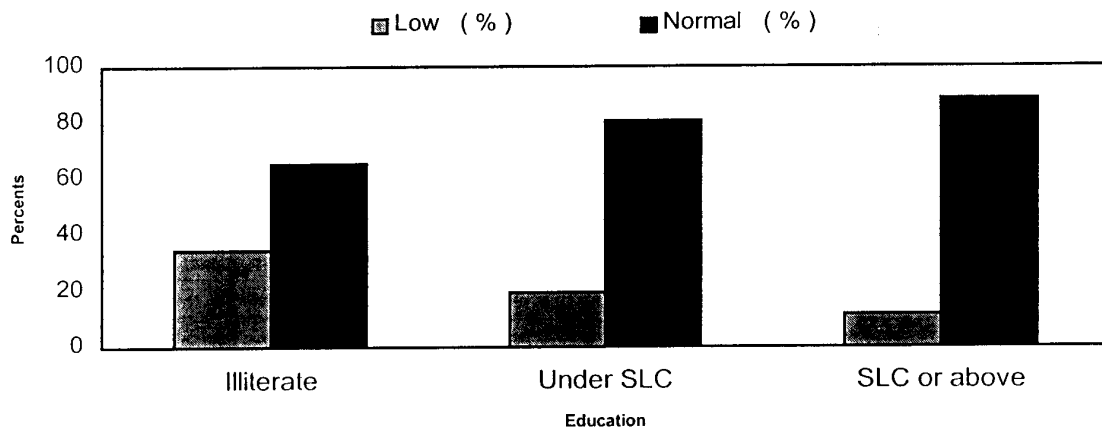
(b) Education levels of father

As like mother's education level, father's education level seems to be associated with the birth weight status of the baby. The table shows that the proportion of low birth weight is highest in illiterate father (37.5%).

Table 9. The education levels of father and birth weight

Education level of father	Birth Weight		Total
	Low (%)	Normal (%)	
Illiterate	14 (37.8%)	23 (62.2%)	37 (100%)
Under SLC	18 (22.2%)	63 (77.8%)	81 (100%)
SLC and above	19 (17.8%)	88 (82.0%)	107 (100%)
Total	51 (22.7%)	174 (77.3%)	225 (100%)

P Value = 0.0420

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4.4.1.4 Occupation

4.4.1.4 (a) Occupation of mother

However, these differences shown in the table are statistically not significant on mother's occupation. But on basis of the simple analysis by percent there is highest number of LBW in the mother who's occupation is business (41.7%), likewise proportion of LBW were observed as 40%, 22.2%, 15%, and 0% in the group laborer, housewife and service holder and others respectively.

Table 10. Occupation of mothers and birth weight of baby

Occupation of mother	Birth Weight		Total
	Low (%)	Normal (%)	
Service	3 (15.0%)	17 (50.0 %)	20 (100%)
Business	5 (41.7 %)	7 (58.3 %)	12 (100%)
Housewife	41 (22.2 %)	144 (77.8 %)	185 (100%)
Labor	2 (40.0 %)	3 (60.0 %)	15 (100%)
Others	0 (0.0 %)	3 (100.0 %)	3 (100%)
Total	51 (22.7%)	174 (77.3 %)	225 (100%)

4. 4.1.4 (b) Occupation of father and birth weight

The table shows that proportion of low birth weight is higher among farmers (35.4%) compared to other occupational groups. The proportion of LBW i.e. 26.7% is in the labors, 25.5% in the business, 14.4% in service holders and 20% in others group.

Table 11. Occupation of father and weight of baby at birth

Occupation of father	Birth Weight		Total
	Low (%)	Normal (%)	
Service	13 (14.4%)	77 (85.6 %)	90 (100 %)
Business	12 (25.5 %)	35 (74.5 %)	47 (100 %)
Agriculture	17 (35.4 %)	31 (64.6 %)	48 (100 %)
Labor	4 (26.7 %)	11 (73.3 %)	15 (100 %)
Others	5 (20.0 %)	20 (80.0 %)	25 (100 %)
Total	51 (22.7 %)	174 (77.3 %)	225 (100%)

4.4.1.5 Ethnicity of respondents

The total population of study subjects was classified into six ethnic groups. This was done on the basis of socio-demographic characteristics of that area. Birth weight was observed carefully among these groups. Though this factor is not statistically responsible for low birth weight. It is still important. It can be the subject of interest which group has the highest proportion of low birth weight. The highest proportion of LBW was observed among the tharu (45%) and 44.4% of in Newar. Similarly 16.7%, 15.9% , 20.0% and 28.9% of found LBW was in the ethnic group Brahmin, Chhetri, Musalman and other group respectively (Table 12).

Table 12. Ethnicity of mother and birth weight of baby

Ethnicity	Birth Weight		Total
	Low (%)	Normal (%)	
Brahmin	9 (16.7%)	45 (83.3%)	54 (100%)
Chhetri	13 (15.9%)	69 (84.1%)	82 (100%)
Newar	4 (44.4%)	5 (55.6%)	9 (100%)
Tharu	9 (45.0%)	11 (55.0%)	20 (100%)
Musalman	3 (20.0%)	12 (80.0%)	15 (100%)
Others	13 (28.9%)	32 (71.1%)	45 (100%)
Total	51 (22.7%)	174 (77.3%)	225 (100%)

4.4.1.6 Family structure and birth weight of newborn baby

Though there is no significant relationship between family structure and birth weight of baby. Slightly, higher percentage (24.2%) of low birth weight was found among the mother of joint family then those of nuclear family (20.6%).

Table 13. Type of family and distribution of low birth weight

Type of family	Birth weight		Total
	Low (%)	Normal (%)	
Nuclear Family	20 (20.6 %)	77 (79.4 %)	97 (100%)
Joint Family	31 (24.2 %)	97 (75.8%)	128 (100%)
Total	51 (22.7%)	174 (77.3%)	225 (100%)

4.4.1.7 Home care during pregnancy

The table 15 represents that the relation between cares provided by relatives and birth weight status is not statistically significant. But the highest percentage of LBW was observed in the group who was provided care by their mother (66.7%). Similarly there is 100% normal birth weight in the mothers who were provided cares during pregnancy by sisters in law. In both groups, there is great variation of zero to 66.7%. There is similar distribution of percentage of LBW among mothers who got care at home during pregnancy by mother in law, husband and all family members with 22.2%, 22.0% and 22.7% respectively.

Table 14. Home-care provider during pregnancy and birth weight

Care provider	Birth Weight		Total
	Low (%)	Normal (%)	
Mother in law	10 (22.2 %)	35 (77.8%)	45 (100%)
Husband	27 (22.0 %)	96 (78.0 %)	123 (100 %)
Sister in law	0 (00.0%)	7 (100 %)	7 (100 %)
Mother	4 (66.7 %)	2 (33.3 %)	6 (100%)
All members	10 (22.7 %)	34 (77.3 %)	3 (100 %)
Total	51 (22.7%)	174 (77.3 %)	225 (100%)

p value = 0.0685

4.4.1.8 Income level of the family

Income levels of the family reflect to the living standard, which can be associated, directly with the birth weights status. The table shows that there is significant difference between levels of family income and birth weight of the baby. More than forty one percent mothers among earning less than 1000 per month gave birth baby with low birth weight. Lowest proportion of LBW was observed in the mothers group having income more than 6000 Rs per month.

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Table 15. Income level of family and distribution of low birth weight

Income Rs. per month	Birth Weight		Total
	Low (%)	Normal (%)	
Less than 1000.	14 (41.2%)	20 (58.8 %)	34 (100%)
1000-2000	11 (25.6 %)	32 (74.4 %)	43 (100 %)
2000-4000	13 (21.0 %)	49 (79.0 %)	62 (100 %)
4000-6000	7 (17.5 %)	43 (82.5%)	40 (100%)
Over 6000	6 (16.7 %)	30 (83.3%)	36 (100 %)
Total	51 (22.7%)	174 (77.3 %)	225 (100%)

p value = 0.0432

Similarly about 25%, 21% and 17.5% of the total births were recorded on low weight among the mothers whose family income was between 1000-2000, 2000-4000, and 4000-6000 Rs per month respectively as per their report. The effect of income level on mothers for giving low birth weight was observed statistically significant (Table 15).

4.4.1.9 Working hours during pregnancy

Daily working hour of the pregnant women seems to influence statistically significant on the birth weight of baby. Fifty percent of the babies born from the mothers with working hours of 8-10 per day were low in weight at birth. Conversely, there is also 50% of births were found to be low in those who were working less than 4 hours. In the group working 6-8 hours and 4-6 hours, the percentage of low birth weight baby was observed by 21.2% and 13.8% respectively (Table 16).

Table 16. Working hours of mother and distribution birth weight

Working hours	Birth Weight		Total
	Low (%)	Normal (%)	
8-10	12 (50.0 %)	12 (50.0 %)	24 (100%)
6-8	22 (21.2 %)	82 (78.8 %)	104 (100 %)
4-6	12 (13.8 %)	74 (86.2 %)	87 (100 %)
Less than 4	5 (50.0%)	5 (50.0 %)	10 (100%)
Total	51 (22.7%)	174 (77.3 %)	225 (100%)

P value = 0.00034

4.4.1.10 Smoking habit of mother

The small portion of mother (5.3%) responded that they smoke during pregnancy. The study showed that proportion of low birth weight is slightly higher in the smokers than the non-smoker mothers (25% and 22%). It shows mother who smokes 1.15 times more likely to have a low birth weight than who do not (Table 17).

Table 17. Smoking habit of mother and birth weight

Smoking habit	Birth Weight		Total
	Low (%)	Normal (%)	
Yes	3 (25.0 %)	9 (75.0 %)	12 (100%)
No	48 (22.5 %)	165 (77.5 %)	213 (100 %)
Total	51 (22.7%)	174 (77.3 %)	225 (100%)

Odds Ratio = 1.15

4.4.1.11 Alcohol drinking during pregnancy

Out of total enrolled mothers, 2.7% of them replied that they took alcohol during pregnancy. Among the mothers who drink the proportion of LBW is about 43 percent. The table shows that there is relation between drinking alcohol and birth weight. It indicates the women who drink during pregnancy, 2.66 times are more likely to give LBW baby compared to mothers who did not.

Table 18. Drinking habit of mother and birth weight

Drinking habit	Birth Weight		Total
	Low (%)	Normal (%)	
Yes	3 (42.9 %)	4 (57.1 %)	7 (100%)
No	48 (22.0 %)	170 (78.0 %)	218 (100 %)
Total	51 (22.7%)	174 (77.3 %)	225 (100%)

Odds Ratio = 2.66

4.4. 2 Health and nutritional factors

The Health and nutritional factors studied during the period were maternal weight, maternal height, iron intake and food intake pattern during pregnancy.

4.4.2.1 Maternal height

Maternal height is one of the important factors associated with birth weight of the baby. In this study, maternal height is found to be associated with birth weight. The result shows that the group of height less than 146 cm has the highest proportion of low birth weight than other height groups. None of the baby was recorded to be low weight at birth from the mothers with height more than 160 cm. Proportion of LBW is decreasing gradually with the increase in mother's height. The difference between the babies in relation to height of mother was observed highly significant. The proportions of LBW were observed by 45.5%, 27.8% and 15.0% in the groups for height 146-150 cm, 151-155 cm and 156-160 cm of height, respectively. The mean height of mother in the study was found to be 151.6 cm (Table 19).

Table 19. Maternal height and weight of baby at birth

Height of mother in cm	Birth Weight		Total
	Low (%)	Normal (%)	
Less or 145	11 (44.0%)	14 (56.0 %)	25 (100%)
146-150	20 (26.7 %)	55 (73.3 %)	75 (100 %)
151-155	15 (18.5 %)	66 (81.5 %)	81 (100 %)
156-160	5 (14.3 %)	30 (85.7%)	35 (100 %)
More than 160	0 (0 .00 %)	9 (100 %)	9 (100 %)
Total	51 (22.7%)	174 (77.3 %)	225 (100%)

P value = 0.0172

4.4.2.2 Maternal weight

Weight records were categorized into five categories. The table specifies with very clear that percentage of low birth weight is decreasing more significantly as the mother's weight increases. The mothers weighing less than 40-kg have the highest proportion low birth weight (50%). Similarly the proportion of LBW seems to be lowest in the group of weight above 54 kg. In the

groups of weight between 40-44 kg, 45-49 kg, and 50-54 kg,, the proportions of LBW have been observed by 45.5%, 27.8% and 15.0% respectively (Table 20).

Table 20. Maternal-weight and birth weight of baby

Weight of mother in kg	Birth Weight		Total
	Low (%)	Normal (%)	
Less than 40	3 (50.0%)	3 (50.0 %)	6 (100%)
40-44	15 (45.5 %)	18 (54.5 %)	33 (100 %)
45-49	22 (27.8 %)	57 (72.2 %)	79 (100 %)
50-54	9 (15.0 %)	51 (85.0%)	60 (100%)
More than 54	2 (4.3 %)	45 (95.7 %)	47 (100 %)
Total	51 (22.7%)	174 (77.3 %)	225 (100 %)

p value = 0.001

Figure 7. Percentage of LBW in relation to maternal weight

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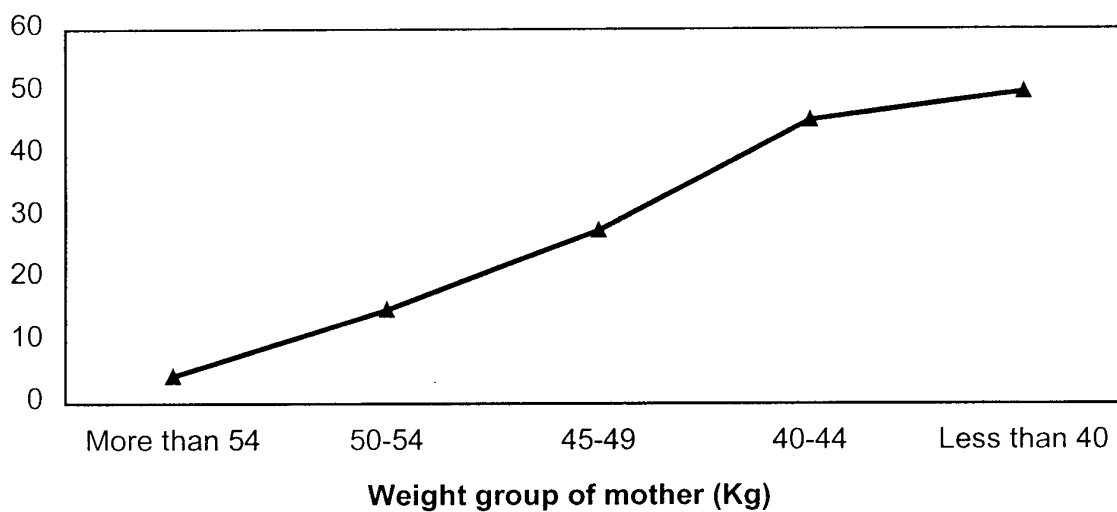
4.4.2.3 Food intake Pattern during pregnancy

Mothers were asked with a simple question of food intake amount during pregnancy compared to the previous usual amount. Proportion of low birth weight was observed by 20.2% in the respondents who take same food amount as previous. Similarly 39.6% of mothers who had decreased their food intake gave birth of low birth weight baby. Those who increased food intake in their pregnancy delivered LBW at 15.4% only (Table 21).

Table 21. Food intake during pregnancy compared to previous state and birth weight

Food intake	Birth Weight		Total
	Low (%)	Normal (%)	
Same	20 (20.2%)	79 (79.8%)	99 (100%)
Decreased	19 (39.6%)	29 (60.4%)	48 (100%)
Increased	12 (15.4%)	66 (84.6%)	78 (100%)
Total	51 (22.7%)	174 (77.3%)	225 (100%)

p value = 0.0051

4.4.2.4 Iron intake during pregnancy and birth weight of newborn

The proportion of LBW was found at 21.2% among the mother who reported to take iron during pregnancy. The corresponding proportion for the mothers who did not take iron tablets during pregnancy was 33%. But by statistics it is not significant on effect of iron consumption during pregnancy. By simple percentage LBW seems to be more common among the respondent who do not take iron during pregnancy.

Table 22. Iron intake during pregnancy and birth weight of baby

Iron intake	Birth Weight		Total
	Low (%)	Normal (%)	
Yes	42 (21.2%)	156 (78.8%)	198 (100%)
No	9 (33.3%)	18 (66.7%)	27 (100%)
Total	51 (22.7%)	174 (77.3%)	225 (100%)

Odds Ratio = 0.54

4.4.3.1 Parity of mother

The table shows that parity of mother does not influence significantly on birth weight of baby. 24.65 percent was the observed proportion of low birth weight in the first parity. Similarly proportions of LBW were found 18.3%, 34.8%, and 12.5% among the group of mothers with second, third and fourth or more parity respectively (Table 23).

Table 23. Parity of mother and weight of the baby at birth

Parity of mother	Birth Weight		Total
	Low (%)	Normal (%)	
First	29 (24.6 %)	89 (75.4 %)	118 (100%)
Second	11 (18.3 %)	49 (81.7 %)	60 (100 %)
Third	8 (34.8 %)	15 (65.2 %)	23 (100 %)
Fourth or more	3 (12.5 %)	21 (87.5 %)	24 (100 %)
Total	51 (22.7%)	174 (77.3 %)	225 (100%)

p value = 0.2377

4.4.3.2 Gestational age of newborn baby

The study showed that gestational age below 37 completed weeks had the highest proportion of LBW (29.3%). Like wise, gestational age 37-42 weeks and more than 42 weeks showed the LBW proportion of 19.0% and 16.6 % respectively (Table 24).

Table 24.Gestational age of pregnancy and birth weight

Gestational age	Birth Weight		Total
	Low	Normal	
Before 37 weeks	24 (29.3%)	58 (70.7%)	82 (100 %)
37- 42 weeks	26 (19.0%)	111 (81.0%)	137 (100%)
More than 42 weeks	1 (16.6%)	5 (83.4%)	6 (100%)
Total	51 (22.7%)	174 (77.3%)	225 (100%)

p value = 0.2357

4.4.3.3 Health problems during pregnancy

Respondents were asked about the presence of health problems or not during pregnancy. 27.6% is the proportion of LBW that was found among the mothers who had health problems during pregnancy. Similarly there was a proportion of LBW by 21.0% among the mothers who had not any problems during pregnancy (Table 25).

Table 25. Health problems during pregnancy and birth weight of baby

Problems	Birth Weight		Total
	Low (%)	Normal (%)	
Yes	16 (27.6 %)	42 (72.4 %)	58 (100%)
No	35 (21.0 %)	132 (79.0 %)	167 (100 %)
Total	51 (22.7%)	174 (77.3 %)	225 (100%)

Odds Ratio = 1.44

4.4.3.4 Birth interval

A higher proportion of low birth weight was identified in the mother group who had a space of less then 2-year. Likewise the proportion of LBW was observed by 19.4% in the spacing of 2 – 3 years, 14.7% in the spacing of 3 – 5 years and 21.7% in the group who had a space of more then five years from the previous baby. But no statististical significance was found (Table 26).

Table 26. Birth interval and weight of baby at birth

Interval of birth	Birth Weight		Total
	Low (%)	Normal (%)	
< Two year	5 (35.7 %)	9 (64.3 %)	14 (100%)
2-3 year	7 (19.4 %)	29 (79.6 %)	36 (100 %)
3-5year	5 (14.7 %)	29 (85.3 %)	34 (100 %)
> 5year	5 (21.7%)	18 (78.3 %)	23 (100%)
Total	22 (20.6%)	85 (79.4 %)	107 (100%)

p value = 0.4583

4.4.3.5 ANC Visit

The table shows that out of total mothers who did not make any ANC visit gave birth with low weight by 54.5% (n=11). And the mother who replied yes for ANC visits was found for giving LBW by 21.0%. By the analysis of odds ratio the mothers with ANC visit has the lesser risk for giving low birth weight than without ANC visit (Table 27).

Table 27. ANC visit during pregnancy and birth weight of newborn baby

ANC visit	Birth Weight		Total
	Low (%)	Normal (%)	
No	6 (54.5 %)	5 (45.5 %)	11 (100 %)
Yes	45 (21.0 %)	169 (79.0 %)	214 (100%)
Total	51 (22.7%)	174 (77.3 %)	225 (100%)

Odds Ratio = 4.51

4.4.3.6 Number of ANC visit

Number of ANC visit during pregnancy made by mothers was also recorded in the category of less then 2, 2 to 4 and more then 4 visit during the time. The table shows that proportion of low birth weight were observed by 24.0%, 19.8% and 21.8 % in the mother having less then 2 visit, 2 to 4 visit and more then 4 visit respectively. There is higher proportion of LBW in the mother having more then 4 visit then the mother who made 2-4 visits.

Table 28. Number of ANC visits and birth weight of newborn baby

Number of ANC visits	Birth Weight		Total
	Low (%)	Normal (%)	
Less than 2	6 (24.0 %)	19 (76.0 %)	25 (100%)
2 to 4	22 (19.8 %)	89 (80.2 %)	111 (100 %)
More than 4	17 (21.8 %)	61 (78.2 %)	78 (100 %)
Total	45 (20.0%)	169 (80.0%)	214 (100%)

p value = 0.8789

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4.5 Perception of mother on the size of baby at birth

The study found out that 42.42% of the infants among the perceived as small by their mothers were less than 2500 gram at birth. The proportion of LBW was found by 19.2% in the babies who were perceived by their mothers as normal weight. The positive predictive value of mother's perception found in the study is 42.4 % for low and 80.8% for normal baby (Table 29).

Table 29. Perception of mother to predict size of baby at birth

Mother's perception	Birth weight		Total	Positive predictive value
	Low	Normal		
Small	14	19	33	42.4%
Normal	34	143	177	80.8 %
Total	48	162	210	

Some of the key findings of this study are compared with the findings of the Multi Hospital Based Study conducted at the same hospital in 1999 (Table30).

Table 30. Key baseline findings with the comparison to previous study (in percentage)

Key baseline findings	Multi Hospital Based Study, 1999	In this study
Illiteracy among mothers	47	36
Rural Residence	62	60
Paternal occupation; Agriculture	29	21
Adolescent, young mother	23	21
Maternal Wt.< 45 kg	25	17
First time pregnancy	53	52
Birth space < 2years	26	6
Minimal ANC (0 ,1 or 2)	60	30
Maternal height < 148 cm	.	18
Smoking habit	6	5
Drinking habit	5	3

Table 31. Summary values of factors associated with birth weight of baby

Factors associated with birth weight.	P Value	Odds Ratio
Age of mother	0.01	
Residence		0.94
Education level (mother)	0.00	
Education level (father)	0.04	
Home care providers	0.06	
Maternal height	0.17	
Maternal weight	0.00	
Occupation (mother)	0.29	
Occupation (father)	0.07	
Family income	0.04	
Birth space	0.25	
ANC (yes /no)		4.51
Iron (yes /no)		0.54
Working hours	0.00	
Food intake (amount)	0.00	
Smoking		1.5
Drinking		2.66
Parity	0.23	
Health problems (yes/no)		1.44
Gestational age	0.24	

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Chapter V

Discussion

Size of infant at birth

At national level the majority of the delivery takes place at home. There is no system of weighing at home. Thus it is difficult to predict whether the baby is under weight at birth or not. One simple way that was adopted in NDHS- 2001 to estimate the size of the baby. Mothers were asked about what size of the baby they had at birth, was based on subjective judgment of mothers. Thus children said to be below average are regarded as under weight. In fact many average size babies are also underweight, but they are often not regarded as being LBW. This method gives a conservative estimate of low birth weight.

The two methods of estimation have been employed; survey data based on maternal recall of infant size at birth, and isolated estimates based on hospital data. Collection of data at household level would optimal. Only 9 percent of the total deliveries occur in health institutions and medical staffs attend only about 10%. The realities of home birth monitoring in the present situation, however, make studies time consuming and expensive.

Birth weight of newborn baby

The over all proportion of LBW was found 22.7 % with a mean birth weight of 2.8 kg. The finding suggests a very small improvement compared to previous study. This prevalence of low birth weight represents on behalf of few people who come for hospital delivery. The large portion of the low birth weight baby should exist in the community.

A study was conducted by MHBS by MIRA and UNICEF in 1999 in the same hospital with the finding of 26% prevalence and mean birth weight of 2.78 kg. The percentage of LBW what was observed in this study is still at very high proportion than adopted goal for reducing LBW prevalence to less than 10% of (The world Summit for children 1990). WHO suggests that public

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health action should be initiated if it is in excess of 15%. Some of the findings on LBW conducted by different organization or professionals were revised in the proposal.

According to these report the rates were found in 1998 by NMIS (19%) and higher rate in prevalence of LBW (34.7%) in Biratnagar Hospital by MIRA and UNICEF in 1999. At present prevalence of LBW in Nepal is expected to be 27% and Nepal is the third country of the world for high prevalence of LBW (21st Falgun Annapurn Post 2059). The similar findings on LBW were found on the report of NDHS 2001(24%) and SWCHW by CBS and UNICEF 2001(21%). These later two studies were based on mother's recall. However, the result of this study itself tries to be true estimate of LBW at present on the basis of previous finding.

The program of the government relating to mother and infant targets that low birth weight should be at decreasing trend (below 23 % by the years of Ninth Plan). But as per received status of LBW in study site it is not decreasing what should have been improved till now.

The study shows that 22.7 % of baby born at hospital are less than 2.5 kg at birth. The cut off point for low birth weight and for normal birth weight is recommended 2.5 kg for necessary action and program.

In this study 12% of baby are just 2.5 kg, which can be considered as normal, but this may not be sufficient to say good weight at birth. If not taken seriously, these births can turn or can be counted into low category. The proportion of baby who weighs more then 2.5 kg was found at 65.3%. The mean birth weight of the newborn baby was found to be 2.80 kg, more similar to Multi Hospital Based Study (2.78kg, 1999). The study found out that there is lack of clear and faire reporting recording system on birth weight. The mothers are not told adequately about this matter during ANC visits and at their home also.

There is the similar distribution of low birth weight in male and female baby. Occurrence of low birth weight has not been affected by sex of the child. There is no relationship at significant level. Proportion of LBW baby was found 22.3 in males and 23.2 in female babies.

General characteristics of mother and birth weight

The total of 225 mothers with their babies at hospital wards was interviewed during the period of study. The interview with mother was completed within seven days for some mothers depending upon their readiness to answer. Infants of their 225 mothers were observed in their weight at birth within 24 hours.

The proportion of LBW was seen highest (36.2%) in the age group below 20 years and than over 35 years age group. The previous studies have shown that the proportion of LBW is likely to be higher in fewer than 20 and above 35 (NMIS, MHBS). This study gives the same kind of birth trend as stated by these studies. The number of delivered women was also seen highest (110) among 20-24years.

The study finds that the population below 20 years of age is 20.9%, and above 35 or 35 years 2.7%, which is the lowest in number among all age groups. The age group 20-24 year comprises 48.8 percent highest in number in study population. The group in year 25-29, 30-34 is comprised by 17.8%, 9.8% of the total population respectively. The lower number of delivery was observed in 35 or more age group. Mostly the hospital delivery attendees were found with young age and primipara mothers, which is the general phenomenon of age structure in hospital delivery. This is the general pattern of fertility that most of the fertility is found to occur in the age group 20-24 year. At the same the most of the first time pregnancy is the major portion of hospital delivery pattern and few come to the hospital who have the problems. The study has shown that primipara mothers in the same hospital (MHBS 1999) comprised 53% of the total hospital deliveries.

Among the total population, 40% were from urban areas and 60% were from rural area in this study. This proportion seems as similar as previous study at the same place. (38 % urban and 62% murals, MHBS 1999). The proportion of LBW was found more or less similar (22.2% and 23.3%) in rural and urban mothers. This slightly difference could be real or due to chance that it differs from the statement that LBW is higher in rural mother than urban. (LBW Prevalence and Associated Factors in Four Region of Nepal, MIRA) This could also be due to disproportionate distribution of study population or people who come from rural area for hospital delivery might be at good socio

economic status comparatively. Women living in urban areas have been found with less risk for giving low birth weight babies compared with the women of rural areas. (NMIS, Fifth cycle). The finding of this study differs from this statement that urban women are with less risk for giving small baby.

Educational background can play most important role in the study subject. The three levels of measurement regarding this were made viz illiterate, under SLC and above then SLC. Proportion of illiterate mother was found at 34.7% (47% in1999 by MHBS) and other 38.7% and 26.6% is under SLC and SLC or above respectively.

The proportion of low birth weight babies was identified as 34.6% in the illiterate mothers, 19.5% in under SLC and 11.7% in the mothers who were SLC pass or above. The difference is found significant (P= 0.0420). This study supports the general concept that education level play vital role in normal birth weight. (Multi Hospital Based Study showed illiteracy in mother was implicated indirectly with the association of low birth weight.) Literate mother is less likely to deliver baby with low birth weight compare with illiterate mother (NMIS, Fifth Cycl,'98) There is slightly difference in proportion of education level between mother and fathers. The study showed paternal illiteracy is more risky for LBW than illiteracy of mother. The paternal education has shown more significant difference between level of education and birth weight status of baby. (P = 0.02). This supports with the report of NMIS, 1998 that a literate household head has less risk of having babies with low birth weight.

Socio- economic and demographic factors and birth weight

Based on occupational character, mostly the mothers were housewives comprising about 82.2%.(95%,MHBS conducted in same place 1999) About 2% women were laborer. Similarly 5.3% are involved in business, 8.9 percent are service holder and 1.3 percent mother reported having other kind of occupation. Businesswomen were shown with highest proportion of LBW (41.7%) than housewife group (22.2%), laborer with (40%). This could be due to effect of sampling bias for both group (N=12 and 5 respectively) and could be due to no sufficient time given to pregnant mothers in these groups or due to other factors.

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Among selected occupational groups (occupation of father), the highest proportion of LBW was found in agriculture worker (35.4%), which is the known occupational group for higher prevalence of LBW. This supports to previous study that higher risk of paternal agriculture occupation was associated with low birth weight (MHBS 1999). In laborer it was 26 %. Likewise, LBW was found 25.5% in business holder, 14.4% in service holder and 20% in other occupational group. But the statically significant difference could not found in occupation of spouse and birth weight.

The total study population was classified into six groups. This was done on the basis of socio-demographic characteristics of that area. Birth weight was observed carefully among these groups. Though, this factor for being not the known responsible factor for low birth weight, it can be the subject of interest which group has the highest proportion of low birth weight The highest proportion of LBW was observed among the tharu (45%) and 44.4% of in Newar, In the Newar group this may be due to affect of small number (9) or may be by other factors. Similarly 16.7% 15.9% and 28.9% were found by percentage of LBW in the ethnic group Brahmin, Chhetri, Musalim and others respectively. The difference what was found is statistically significant.

There is no significant relationship between family structure and birth weight was found. A slightly, higher percentage (24.2%) was found among the mother of joint family then those of nuclear family (20.6%). In large family, care of mother during pregnancy is likely to be poor than the care of mother in nuclear families. This factor may be contributing to the difference or other factors can play which were not discussed or large families are more associated with the poor socioeconomic condition.

The study represents that the relation between cares provided by relatives and birth weight status is not statistically significant. But the highest percentage of LBW was observed in the group who was provided care by their mother (66.7%). Similarly there is 100% normal birth weight in the mothers who were provided cares during pregnancy by sisters in law. In both groups, there is great variation of zero to 66.7%. This could be due to effect of small number (cared by mother=6) and (cared by sister in-law=7). There is similar distribution of percentage of LBW among others who got care at home during pregnancy by mother in la, husband and all family members (22.2 to 22.7%).

An income level of the family reflects in the standard of living, which can be associated, directly with the birth weight status. The result shows that there is significant difference between levels of family income and birth weight of the baby (P= 0.04). More than forty one percent mothers among earning less than 1000 per month gave birth baby with low birth weight. Lowest proportion of LBW was observed in the mothers group having income more than 6000 Rs per month. As the income level raises the proportion of LBW tends to fall. The affect of income level for giving low birth weight was observed statistically significant. This supports that socio economic status of family is one of the contributing factors of low birth weight.

Daily working hours of the pregnant women seems to significantly influence birth weight of baby (P= 0.000). Fifty percent of the baby was low in weight born from the mothers with working hours of 8-10 per day. Conversely, there is also 50% of births were found to be low in those who were working less than 4 hours. This might be due to effect of small number (N=10) or due to other factors. In the group working 6-8 hours and 4-6 hours, 21.2% and 13.8% were observed percentage of low birth weight baby respectively. The over exertion during pregnancy leads to depletion in body energy how much caloric She consume daily. This situation renders women to under nourished during pregnancy, which results in fetal growth retardation and giving a low weight baby. This is the situation nutritional condition of young women, which might have been steamed from the pre conception period.

The respondents were asked about the habit of smoking birth weight on yes or no. The findings shows that small portion of mother (5.3%) did respond with yes is near to the figure of previous study (6% MHBS 1999). There is no significant difference between smokers and non-smokers for low birth weight. But there is risk for LBW who smokes during pregnancy. A woman who smokes during pregnancy has 1.5 times the risk of delivering a low birth weight baby (NMIS).

Out of total enrolled mothers, 2.7% of them replied that they consumed alcohol during pregnancy (5% in 1999's MHBS study). The study shows that there is relation between drinking alcohol and birth weight status. Although there is too small in number for accepting drinking, indicate the women who drink during pregnancy will likely to deliver small baby than those who do not.

Health and nutritional factors

Maternal height is the important and most strong factor known to be associated birth weight of the baby. In this study, maternal height was observed to statistically significant association with birth weight (P = 0.01). The study reveled that the group of height less than 146 cm has the highest proportion of low birth weight (44%) than other height group. None of the baby was reported to be low weight at birth from the mothers with height more than 160 cm. There is a remarkable association between height of mother and weight of baby. Proportion of LBW is decreasing steadily with the increase in mother's height. The difference is highly significant. The proportions of LBW were observed by 26.7%, 18.5% and 14.3 % in the groups for height 146-150cm, 151-155cm and 156-160 cm of height, respectively. The mean height was 151.6-cm compared to 152.6 in1999 of MHBS, more or less similar finding regarding the stature of mother.

The study specifies with very clear that birth weight is decreasing more significantly as the mother's weight increases. The study shows those mothers weighing less than 40 Kg gave birth baby with the proportion of LBW at 50 percent. Similarly the proportion of LBW seems to be lowest in the group of weight above 54 kg. The pre pregnancy weight of mother could not found because of not recording and non-weighing practices during pregnancy at regular. Recording at the time of delivery could no be possible for all. So the post delivery weight was taken in the convenience for researcher as well as for mothers. The mean weight of mother was 49.2 kg. (47.3 kg MHB study 1999) with SD of 5.99. This factor was strongly associated low birth weight of the baby which is also most known factor for LBW infant.(P= 0.0001) This factor is found responsible as identified by other studies.

Food intake pattern of pregnant mother can play vital role in birth weight of newborn. To get information about it, mothers were asked with a simple question relating food intake amount in relation to non-pregnant state of mother. This question was categorized into same as before, decreased than before and increased than before (P= 0.005).

Proportion of low birth weight was observed by 20.2% in the women who replied for same food category. Similarly 39.6% of low birth baby were found among those who replied that they had the

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amount of food less than non-pregnant status. Those who increased food intake in their pregnancy delivered LBW at 15.4% only. In this study food factor as previous concept is strongly associated with birth weight status. This shows highly significant difference between food intake and birth weight. A same kind of information has been given in the report of Status of Women and Children and House hold by CBS and UNICEF in which the pattern food intake was 51 %, 36 % and 13% for decreased, same and increased respectively (P= 0.005).

The proportion of LBW was found 21.2%and 33.3% among the mother who took and didn't take iron respectively. This result supports in general as well as known concept that iron is essential for fetal development and growth. But in this study statically no strong relation was found. This could be due to recall bias in mothers, They might not take full course of iron during the time, ANC services might not be effective for good compliance during the visit or other factors may play in this regard.

Reproductive factors

In this study the parity of mother does not influence significantly on birth weight of baby and number of parity. 24.6 % observed proportion of low birth weight was in the first parity. Similarly proportions of LBW were found 18.3%, 34.8%, and 12.5% among the group of mothers with second, third and fourth or more parity respectively. Studies have shown that LBW is likely to occur in first parity and above third parity (MHBS and Epidemiological Factors Affecting Low Birth Weight).

The study shows that gestational age below 37 completed weeks has the highest proportion of LBW (29.3%) and the other mothers group of gestational age 37-42 weeks and more than 42 weeks showed the same by 19.0% and 16 % respectively. Proportion of LBW before 37 weeks means low weight is due to prematurity in the fetus or pre term birth. The contribution of pre term births to total births is 36%. The percentage of pre term LBW to total LBW has been found by 47%, which differs from the findings of other study.

Around two thirds birth of LBW born at term which is considered due to IUGR. The LBW in the pre term birth found in higher proportion in this study may be due to recall bias while recording the date of LMP from the mothers during interview. The ratio of pre term LBW to term LBW is 47:53.

The proportion of LBW was more than twenty seven percent among the mothers who had health problems during pregnancy. Similarly the LBW was at 21.0% among the mothers who had not problems during pregnancy (Odds Ratio = 1.44). The result in this subject is similar to the study conducted by NMIS in 1998 (OR = 1.48).

During the study, a higher proportion of low birth weight was found in the mother group who had a space of less then 2-year. Likewise the proportion of LBW was observed by 17.6% in the spacing of 2 – 3 year, 12.5% in the spacing of 3 – 5 years and 25% in the group who had a space of more then five years from the previous baby. The proportion of LBW in spacing below 2 years is similar to other studies. But in case of 25% LBW in the spacing >5 years not similar to previous ones. This could be due to affect of factors other than spacing such as age factor, parity, or other health problems.

The study showed that out of total mothers who did not make any ANC visit gave birth with low weight by 54.5%(n=11). Similarly the proportion of low birth weight was 21.0% among the mother who had the visit (Odds Ratio = 4.51). By analysis proportion ANC visit has the significant role for giving normal birth. The study is supported by the other reports that the risk factor absence of ANC visits has the significant role in birth of low weight babies.

Number of ANC visit during pregnancy made by mothers was also associated with the low birth weight babies. The study found that the visits, i.e. less than 2, 2 to 4 and more then 4 visits during the time of pregnancy had the relationship with proportion of low birth weight by 24.0%, 19.8% and 21.8 % respectively. There is higher proportion of LBW in the mother having more then 4 visit then the mother who made 2-4 visits. In this situation some external factors may be responsible for LBW stronger than ANC check up or it can be said that the quality of ANC is poor.

Perception of mother on the size of their baby at birth

Around forty two percent (42.4) of among the babies perceived as small by their mother were found with low birth weight. Similarly proportion of NBW was found by 80.8% among the babies whose mothers perceived them as normal weight. This means that mothers' decision is more correct to say normal weight than low weight at birth.

Likewise mothers' perception value was calculated as 42.4% for positive predictive value for detecting small and 80.8 % for detecting as normal. A similar study conducted on mother's recall of infant weight at birth in the evaluation of LBW prevalence in which recall of small at birth by mother had positive predictive value of 83 % greater than the value of this study.[21]

Sensitivity result of the mother's perception on the size baby at birth was not with the high accuracy in this study. The method "mother's recall" has been used frequently in the community level studies to estimate prevalence of LBW. Though usefulness of this method in certain time, the result of such method can not be as valid as derived from hospital.

Trends in hospital delivery and low birth weight

Hospital records relating to proportion of hospital delivery, type of delivery and incidence of LBW were taken from respective hospital record unit. A five-year trend on hospital delivery percentage and incidence of low birth weight was made. In the study, an increasing trend in hospital delivery proportion (11% in 054/55 to 14.3% in 058/59) was found during the past five years. In the district, proportion of hospital delivery has been increased to the level above than national hospital delivery proportion (9%, NDHS 2001). This higher proportion of hospital delivery of the district might be contributed by increase in hospital facility, increase in awareness level and referral services. However compared to the efforts made and increased services, proportion of hospital delivery can be expected even higher. Similarly the percentage of low birth weight was found fluctuated between the period of five years. This unspecific trend of LBW could be due to the factors related to recording and reporting system in the hospital or due to misinterpretation of low birth weight, which was experienced during the study or other factors may play for being so.

Chapter VI

Conclusion and recommendations

Conclusion

The study has found that 22.7 % of baby born at hospital were low in birth weight as per of the definition of WHO. The proportion of low birth weight in this study is slightly lower than other studies. The mean birth weight of infant is found more or less similar to other study, which was 2.78 kg, compared to 2.80 kg of this study.

This is the small improvement in birth weight compared to previous one. This rate is among the few people who come hospital for delivery. The large portion of the low birth weight baby should exist in the community level where about 90 % of the deliveries take place. It is recommendable to draw the true value from the community by applying appropriate method in the coming time.

Associated factors for LBW have been observed as much as similar to identified by previous studies. The probable factors associated with the birth weight found in this study were; low weight of mother (P = 0.00), short stature of mother (P = 0.01), low educational level of mother (P=0.00), low education level of father (P = 0.04), long working hours (P = 0.00), food intake amount during pregnancy (P = 0.00), low family income (P = 0.04) and ANC visit (OR = 4.51). Other factors such as birth space, smoking habit of mother, drinking habit, iron intake during pregnancy, and occupation of mother and father has been found to be important factors for the birth weight of new born.

Based on analysis of hospital records regarding hospital delivery practices and incidence of LBW infant, percentage of hospital delivery has been increased from 11% in 2054/55 to 14.3% in 2058/59, which seems to be higher than the national level proportion of hospital delivery. This could be due to increased accessibility of hospital services in the district, increased awareness and improvement in referral services.

On the observation, prevalence of low birth weight infants was not in a similar distribution between the periods of five years. Incidence of LBW based on hospital records was observed as 22.4% in

2054/55, 28.0% in 2058/59. Similarly the proportions of low birth weight were found at 12.4 %, 32.4% and 26.3% in the year 055/56, 056/57 and 057/58 respectively.

The study revels that mothers can estimate the size of their baby with positive predictive value of 42.42% for low birth weight babies. Like wise mother's perception has been found with 80.8% positive predictive value to estimate the size of normal weight babies. With the reference of this value of mothers such method can be applied in the community to estimate prevalence of low birth weight where weighing of newborn cannot be feasible. But in this study mother's perception for estimating the size of baby at birth was not found with high sensitivity.

Recommendations

The prevalence of low birth weight has not been reduced to the level targeted by the nutrition program of Ministry of Health. The program activities relating to the children and mothers need to be reinforced by the responsible authorities. Based on the findings of this study the following recommendations are made for effective implementation.

1. Maternal nutrition is the crucial factor to get satisfactory weight during pregnancy as well as to improve general health status of women. Maternal under weight during pregnancy is one the strongest associated factor for occurrence of low birth weight. The effective program activities for pregnant women and adolescent girls should be conducted. ANC services should be made more effective in terms of all its components recommended for pregnant women. For example there should be adequate ANC visit, good compliance by mothers on advises, micronutrients to be provided for them.

2. A higher percentage of low birth weight has been observed in less than 20 years (36%) and above 35 years women (33%) compared to other age group in between these ranges. The program related to the services of safer motherhood, reproductive health and other aspects should be made more effective and efficient particularly in avoiding early marriage, early pregnancy, too close birth space and too late conception.

3. Food intake pattern of mother should be improved. Necessary information on food and nutrition should be provided. They need to increase food amount during pregnancy in order to achieve timely growth and development for the mother and their fetus.

4. Women should be taught on working pattern during pregnancy. Heavy and prolong working during the time specially after second trimester of pregnancy should be discouraged.

5. The proper recording and reporting mechanism can contribute in reducing low birth weight baby by providing facts necessary for program management and implementation. So in this regard, there should be the proper management information system in the hospitals.

6. Hospital delivery services have not yet wide coverage, and still less than expected. Referral mechanism should be effective and strengthened. Emergency obstetric services need to be extended to the peripheral levels.

7. Research activity in the situation of low birth weight should be conducted in regular interval of time to provide timely information. Such research activities should be conducted in large scales and different site of hospital as well as community rather than a repeated study in one site.

8. In addition to increasing ANC visit number, programs to increase female literacy, women empowering and engendering should be initiated, strengthened, organized which can reduce low birth weight.

9. Literacy of the heads of house holds have been found providing good support and care during pregnancy and labor. They can contribute in reducing low birth weight if they are provided educational talks. So there must be as such informal education programs, which can increase the level of education and awareness in this regard illiterate.

10. Short stature of mother that is difficult to address in recommendations for the short term but that would be amenable to change over a long period of time in general for reducing stunting in girlhood.

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Questionnaire

Part one- Related to mothers and baby

Section 1. Socio-demographic information

1. Name of respondent ....   Name of husband ....

2 . Age of respondent ....   Age of husband ....

3. Education of respondent   Education of husband :

    a. Illiterate   a. Illiterate

    b . Under SLC   b. Under SLC

    c . Above SLC   c. Above SLC

4. Address ....

5. Ethnicity:

    a. Brahmin   b. Chetri   c. Muslim   d. Newar   e. Tharu   f. Others

6. Religion:

    a. Hindu   b. Muslim   c. Budhist   d. Others

7. Structure of family:

    a. Joint   b. Nuclear

8. During pregnancy who cares / loves in the family

    a. Mother in law   b. Husband   c. Sister in law   d. All

9. Height of the mother

        a. Less than 140 cm,   b.141-145 cm   c. 146-150 cm

        d. 151-155 cm   e.156-160 cm   f.. More than 161 cm

10. Mother's Weight in kg: ....

Section 2. Socio-economic information

1. Occupation of mother   Occupation of husband

        a. Service   b. Business   a. Service   b. business

        c. House wife   d. Labor   c. Agriculture   d. Labor

        e. Others   e. Others

2. Income of the household (RS. Per month)

        a. Less than 1000   b. 1000-2000   c. 2000-4000

        d. 4000-6000   e. More than 6000

3. How long did you work during pregnancy everyday?   .... hours.

4. Did you rest in between the working hour?

        a. Yes   b. No

           If yes, how long?   How long?..

5. Do you have land for farming?

        a. Yes   b. No

           If yes, how much? ....

Section 3. Nutrition and food pattern

1. How many times did you take your food every day?

        a. Two times per day   b. Three times per day

        c. Four times per day   d. More than 4 times per day

2.   What types of food you preferred and take during pregnancy?

Please specify the food..

3. Do you have habit of dieting before and during pregnancy?

a. Yes   b. No

If yes, what type of food you take daily?

Please specify the food ....

4. With whom did you take food during pregnancy?

a. With all family members   b. Alone

c. Husband   d. Sister in laws

5. What was the quantity of food taken during pregnancy compared to non-pregnant status?

a. Same   b. Increased   c. Decreased

6. Did you smoke during pregnancy?

a. Yes   b. No

If yes, how many sticks did you smoke per day?

i.1-2 sticks   ii.3-4 sticks   iii. More than 4 sticks

7. Do you have habit of drinking alcohol?

a. Yes   b. No

If yes, how much?

i. Once a week   ii. 2-3 times/week   iii. More than 3 times/week

8. When did you take your food during the time of pregnancy?

a. At first   b. In the middle   c. At last

Section 4. Related to reproductive factors

1. How many children do you have? .... (in number)

2. Did you suffer from the health problems during pregnancy?

    a. Yes   b. No

        If Yes, specify what were the problems?

....

3. How old is your previous baby than this?   Year ....

4. Date of your last menstrual period?...

5. Date of delivery ....

6. Age of gestation..

8. Did you visit for antenatal checkup?

    a. Yes   b. No

        If yes, how many visits?

           i. Less than 2 visit   ii. 2-4 Visits   iii. 4 or more

9. Where did you visit for ANC?

      a. HP/SHP/PHC   b. Hospital   c. Private clinic

10.. Did you take Iron/folic acid tablet during pregnancy?

    a. Yes   b. No

        If yes for how long you took?

         i.< 1 month   ii. 1-2 months   iii. 3-4 months   iv. > 4 months

11. Have you been pregnant with your own desire?

    a. Yes   b. No

12. What is the size of your recent baby?

    a. Small   b. Normal   c. Do not know

13. Do you remember, what was the size of your last baby?

    a. Small   b. Normal   c. Do not know

Section 5. Information on new born baby

1. Birth weight of the baby in grams

    a. Less than 20000 grams   b. 2000-2499 grams

    c. 2500-3000 grams   d. More than 3000 grams

2. Sex of the baby:

    a. Male   b. Female.

Part- Two related to hospital information

1. Name of hospital: -

2. Form to collect required information from the hospitals: -

Fiscal year	Expected pregnancy	Total delivery at hospital	Low birth weight

Thanks for cooperation.

Signature of the interviewer--------------------------

District map

DISTRICT: BANKE
ZONE: BHERI

BARDIYA

SALLYAN

INDIA

NEPALGUJ

DANG

SCALE 1: 185,000
Km. 10 5 0

LEGEND

1.	INTERNATIONAL BOUNDARY	....
2.	ZONAL BOUNDARY	....
3.	DISTRICT BOUNDARY	....
4.	ALL WEATHER ROAD	....
5.	SEASONAL ROAD	....
6.	TRACK	....
7.	MUNICIPALITY	....
8.	ILAKA NO. (Figure inside)	....
9.	VILLAGE DEVELOPMENT COMMITTEE (VDC) (Figure inside indicates population)	....

HEALTH INSTITUTIONS

1.	HOSPITAL (H.M.G.)	....	⊕
2.	HEALTH CENTER	....	▶
3.	PRIMARY HEALTH CARE CENTER	....	▷
4.	HEALTH POST (Ilaka)	....	■
5.	HEALTH POST (STATIC)	....	▨
6.	AYURVED AUSHADHALAYA	....	0